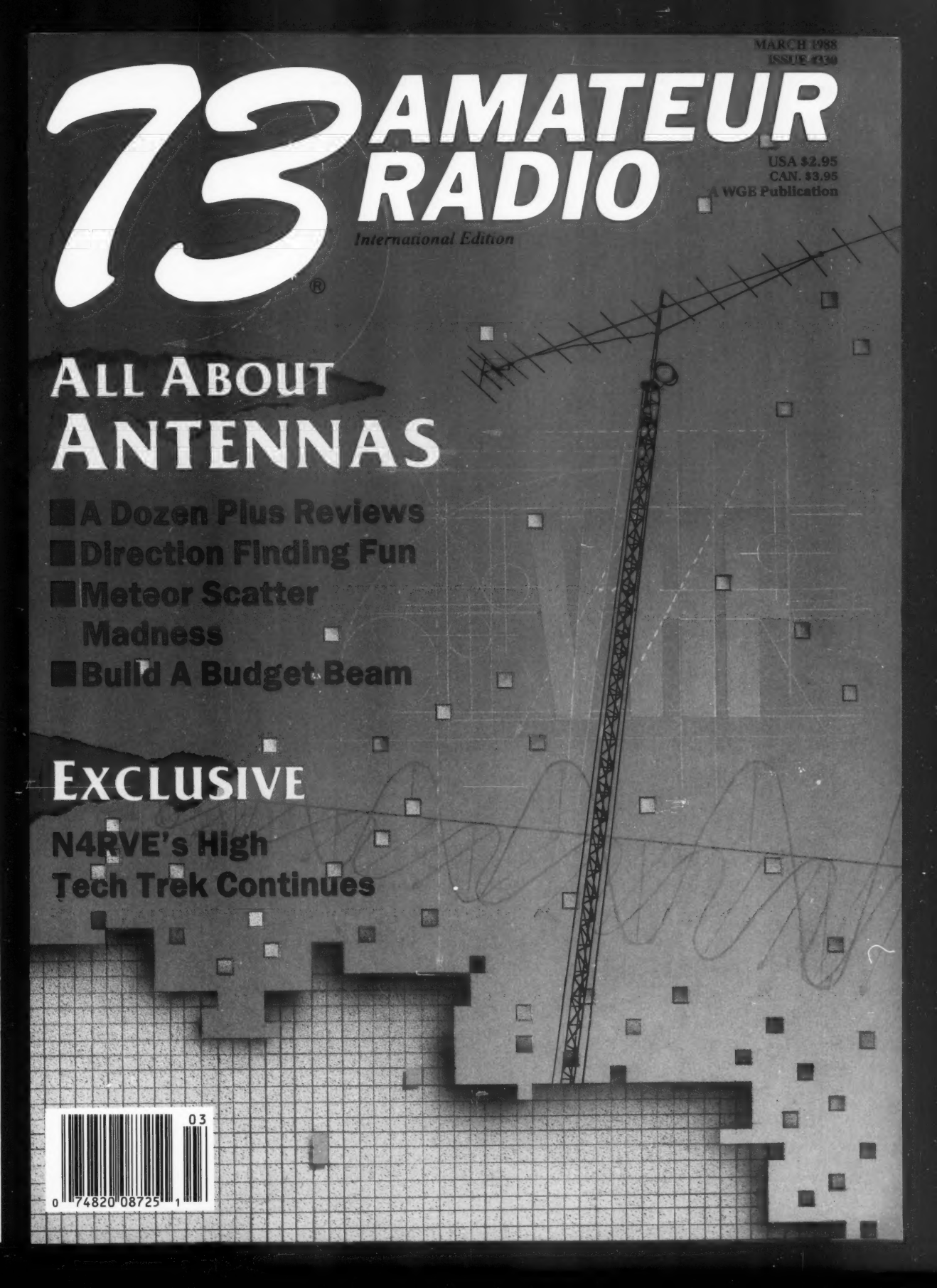
MARCH 1988
ISSUE 4330

73 AMATEUR RADIO

USA $2.95
CAN. $3.95
A WGE Publication

International Edition



ALL ABOUT ANTENNAS

- A Dozen Plus Reviews
- Direction Finding Fun
- Meteor Scatter Madness
- Build A Budget Beam

EXCLUSIVE

N4RVE's High Tech Trek Continues

03
0 74820 08725 1

ICOM

IC-735 HF Transceiver

'MOST RELIABLE HF'

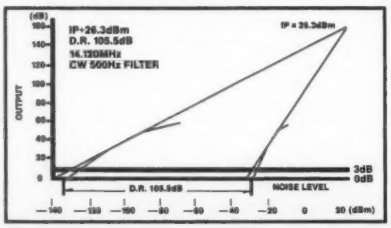
"Of all the possible radios, I chose the ICOM IC-735 for my CQWW QRP world record attempt."

Danny Eskenazi, K7SS, World High QRP Score
-1987 CQWW SSB (PJ2FR)*
-1986 CQWPX SSB (K7SS/WH6)
-1986 ARRL DX PHONE & CW (K7SS/KH6)

ICOM's IC-735 is the world's most popular HF transceiver. With the highest performance, smallest size, and best customer satisfaction of any HF transceiver, the IC-735 is the winner's choice for fixed, portable, or mobile operations.

- **Field Proven 100W Transmitter** with 100% duty cycle. Proudly backed with ICOM's full one-year warranty.
- **105dB Dynamic Range Receiver** includes passband tuning, IF notch, adjustable noise blanker, and semi or full CW QSK.
- **Conveniently Designed.** Measures only 3.7"H by 9.5"W by 9"D.

- **Optional AH-2 Automatic Tuning Mobile Antenna System** covers 3.5MHz-30MHz and tracks with the IC-735's tuned frequencies.
- **All HF Amateur Bands and Modes** plus general coverage reception from 100KHz-30MHz.



- **12 Tunable Memories** operate and reprogram like 12 separate VFO's. Supreme flexibility!

Additional Options: SM-10 graphic equalized mic. PS-55 AC power supply, AT-150 automatic antenna tuner for base operation.

ICOM's IC-735... a proven winner for reliable worldwide HF communications. See it today at your local ICOM dealer.

ICOM

ICOM America, Inc.
2380 116th Avenue N.E., Bellevue, WA 98004
Customer Service Hotline (206) 454-7619
3150 Premier Drive, Suite 126, Irving, TX 75063
1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
ICOM CANADA, A Division of ICOM America, Inc.,
3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4

All stated specifications subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 735188.

*Final contest results pending.

THE ALL NEW PRIVATE PATCH IV BY CSI HAS MORE COMMUNICATIONS POWER THAN EVER BEFORE

- **Initiate phone calls from your HT or mobile**
- **Receive incoming phone calls**

NEW! • **Telephone initiated control . . .**

- ✓ **Operate your base station with complete control from any telephone**
- ✓ **Change frequencies from the controlling telephone**
- ✓ **Selectively call mobiles using regenerated DTMF from any telephone**
- ✓ **Eavesdrop the channel from any telephone**
- ✓ **Use as a wire remote using ordinary dial up lines and a speaker phone as a control head.**

The new telephone initiated control capabilities are awesome. Imagine having full use and full control of your base station radio operating straight simplex or through any repeater *from any telephone!* From your desk at the office, from a pay phone, from a hotel room, etc. You can even change the operating channel from the touchpad!

Our digital VOX processor flips your conversation back and forth fully automatically. There are no buttons to press as in phone remote devices. And you are in full control 100% of the time!

The new digital dialtone detector will automatically disconnect Private Patch IV if you forget to send # (to remotely disconnect) before hanging up. This powerful feature will prevent embarassing lock-ups.

The importance of telephone initiated control for emergency or disaster communications cannot be overstated. Private Patch IV gives you full use of the radio system from any telephone. And of course you have full use of the telephone system from any mobile or HT!

To get the complete story on the powerful new Private Patch IV contact your dealer or CSI to receive your free four page brochure.

Private Patch IV will be your most important investment in communications.

✓ = **NEW FEATURE**

- ✓ * /# or multi-digit connect/disconnect
- ✓ Fully regenerated tone dialing
- • Pulse dialing
- • Toll protection
- • Secret toll override code
- • Busy signal disconnect
- ✓ Dialtone disconnect
- • CW identification
- • Activity timer
- • Timeout timer
- ✓ Telephone initiated control
- ✓ Regenerated DTMF selective calling
- • Ringout
- ✓ Ringout or Auto Answer on 1-8 rings
- • Busy channel ringout inhibit
- ✓ Status messages
- ✓ Internally squelched audio
- • MOV lightning protection
- ✓ Front panel status led's
- ✓ Separate CW ID level control
- ✓ 24 dip switches make all features user programmable/selectable.

- ■ Connects to MIC and ext. speaker jack on *any* radio. Or connect internally if desired.
- ■ Can be connected to any HT. (Even those with a two wire interface.)
- ■ Can be operated simplex, through a repeater from a base station or connected directly to a repeater for semi-duplex operation.
- ■ 20 minutes typical connect time
- ■ Made in U.S.A.

OPTIONS

1. ½ second electronic voice delay
2. FCC registered coupler
3. CW ID chip

CONNECT SYSTEMS INC.
23731 Madison St.
Torrance CA 90505
Phone: (213) 373-6803

AMATEUR ELECTRONIC SUPPLY
Milwaukee WI, Wickliffe OH, Orlando FL, Clearwater FL, Las Vegas NV
BARRY ELECTRONICS CORP.
New York NY
EGE, Inc.
Woodbridge VA
ERICKSON COMMUNICATIONS
Chicago IL
HAM RADIO OUTLET
Anaheim CA, Burlingame CA Oakland CA, Phoenix AZ San Diego CA, Van Nuys CA, Atlanta GA
HENRY RADIO
Los Angeles CA
INTERNATIONAL RADIO SYSTEMS
Miami FL
JUNS ELECTRONICS
Culver City CA
MADISON ELECTRONICS SUPPLY
Houston TX
MIAMI RADIO CENTER CORP.
Miami FL
MIKES ELECTRONICS
Ft. Lauderdale, Miami FL
N&G DISTRIBUTING CORP.
Miami FL
OMNI ELECTRONICS
Laredo TX
PACE ENGINEERING
Tucson AZ
THE HAM STATION
Evansville IN
WESTCOM
San Marcos CA
CANADA:
CARTEL ELECTRONIC DISTRIBUTORS
Surrey B.C.
COM-WEST RADIO SYSTEMS, LTD.
Vancouver B.C.

CIRCLE 12 ON READER SERVICE CARD

Magnetic Attraction

Tired of paying higher and higher prices for V.H.F. magnetic mount antennas? Hustler has the solution. Two new series of antennas at suprisingly affordable prices. Built with the same quality and performance you expect from a Hustler product. Designed to offer you years of trouble-free operation. Priced to **save you money.**

FX SERIES (pictured mounted)

- 3.4 db gain | 5/8 wave
- 200 watt rating
- 15 foot coax
  PL-259 connector installed
- Magnetic mount holds to
  100 mph

Model FX-2 — 2 Meter, black & chrome
Model FX-220 — 220 MHz, black and chrome

24.95 ea.

Also Available in Black
Model FX-2B, 2 Meter
Model FX-220B, 220 MHz ..... **29.95** ea.

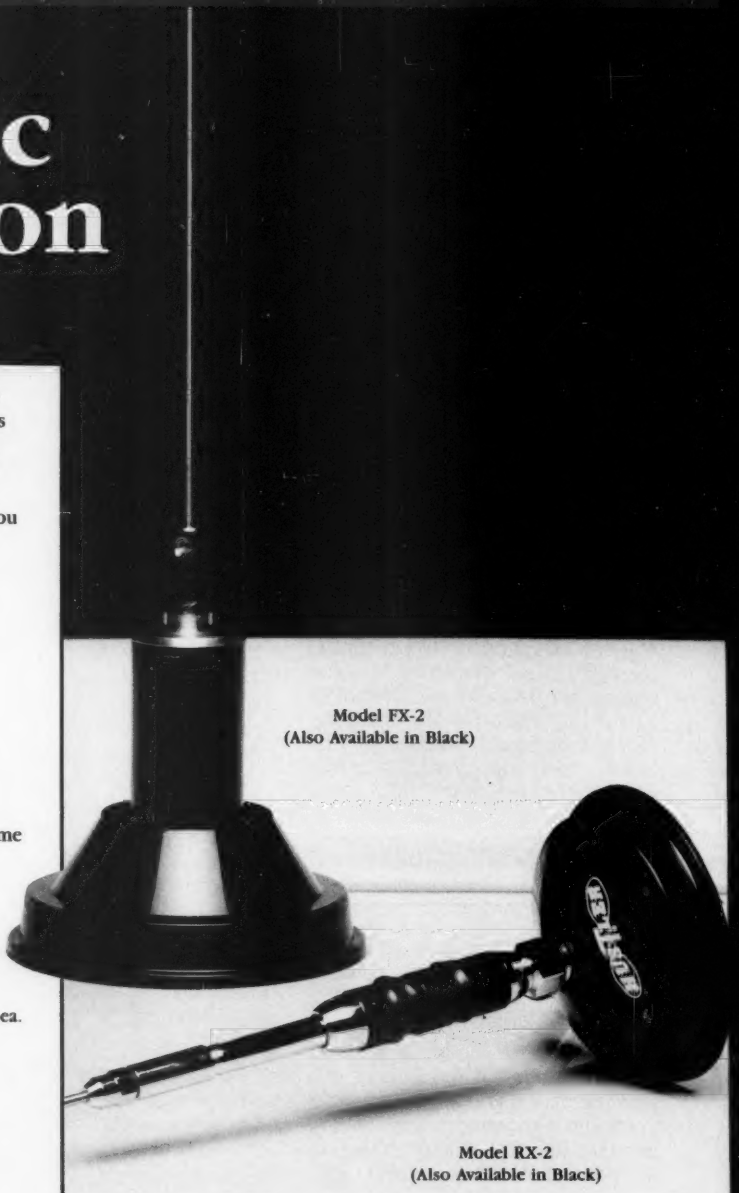
RX SERIES (pictured lying down)

- 3.4 db gain | 5/8 wave
- 100 watt rating
- 15 foot coax
  PL-259 connector installed
- Magnetic mount holds to 75 mph

Model RX-2, 2 meter black and chrome
Model RX-220, 220 MHz, black & chrome

19.95 ea.

Also Available in Black
Model RX-2B, 2 meter
Model RX-220B, 220 MHz ..... **24.95** ea.



Model FX-2
(Also Available in Black)

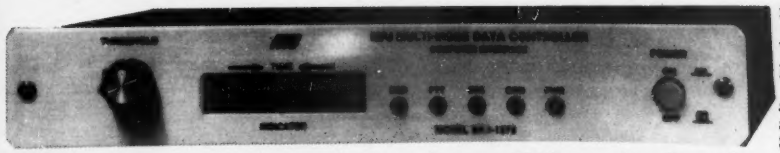
Model RX-2
(Also Available in Black)

HUSTLER®

One Newtronics Place
Mineral Wells, Texas 76067
(817) 325-1386

CIRCLE 269 ON READER SERVICE CARD

MFJ multi-mode data controller



MFJ *shatters* the 6 mode barrier *and* the price barrier with the MFJ-1278 and gives you . . . Packet, RTTY, ASCII, CW, WEFAX, SSTV and Contest Memory Keyer . . . 7 digital modes . . . for an affordable $249.95

Amateur radio's newest multi-mode data controller -- the MFJ-1278 -- lets you join the fun on Packet, RTTY, ASCII, CW, Weather FAX, SSTV and gives you a full featured Contest Memory Keyer mode . . . you get 7 modes . . . for an affordable $249.95.

Plus you get high performance HF/VHF/CW modems, software selectable dual radio ports, precision tuning indicator, 32K RAM, AC power supply and more.

You'll find it *the most user friendly of all multi-modes.* It's menu driven for ease of use *and* command driven for speed.

A high resolution 20 LED tuning indicator lets you *tune in signals **fast** in any mode.* All you have to do is to center a single LED and *you're precisely tuned in to within 10 Hz* -- and it shows you which way to tune!

All you need to join the fun is an MFJ-1278, your rig and any computer with a serial port and terminal program.

You can use the MFJ Starter Pack to get on the air instantly. It includes computer interfacing cable, terminal software and friendly instructions . . . everything you need to get on the air fast. Order MFJ-1282 (disk)/MFJ-1283 (tape) for the C-64/128 and VIC-20 or MFJ-1284 for the IBM or compatible, $19.95 each.

Packet

Packet gives you the fastest and most reliable error-free communications of any amateur digital mode.

With MFJ's super clone of the industry standard -- the TAPR TNC-2 -- you get **genuine TAPR** software/hardware plus more -- not a "work-a-like" imitation.

Extensive tests published in *Packet Radio Magazine* ("HF Modem Performance Comparisons") prove the TAPR designed modem used in the MFJ-1278 gives better copy with proper DCD operation under all tested conditions than the other modems tested.

Hardware DCD gives you more QSOs because you get reliable carrier detection under busy, noisy or weak conditions.

A hardware HDLC gives you full duplex operation for satellite work or for use as a full duplex digipeater. And, it makes possible speeds in excess of 56K baud with a suitable external modem.

Good news for SYSOPs! New software lets the MFJ-1278 perform flawlessly as a WORLI/WA7MBL bulletin board TNC.

Baudot RTTY

You can copy all shifts and all standard speeds including 170, 425 and 800 Hz shifts and speeds from 45 to 300 baud. You can *copy not only amateur RTTY but also press, weather and other exciting traffic.*

A high performance modem lets you copy both mark and space for greatly improved copy under adverse conditions. It even tracks slightly drifting signals.

You can transmit both narrow and wide shifts. The wide shift is a standard 850 Hz shift with mark/space tones of 2125/2975 Hz. *This lets you operate MARS and standard VHF FM RTTY.*

You get both the American Western Union and the international CCITT character sets, Autostart for unattended reception and selectable "Diddle".

A receive Normal/Reverse software switch eliminates retuning and Unshift-On-Space reduces errors under poor receiving conditions.

ASCII

You can transmit and receive 7 bit ASCII using the same shifts and speeds as in the RTTY mode and using the same high performance modem. You also get Autostart and selectable "Diddle".

CW

You get a Super Morse Keyboard mode that lets you send perfect CW effortlessly from 5 to 99 WPM, including all prosigns -- it's tailor-made for traffic handlers.

A huge type ahead buffer lets you send smooth CW even if you "hunt and peck".

You can store entire QSOs in the message memories, if you wanted to! You can link and repeat any messages for automatic CQs and beaconing. Memories also work in RTTY and ASCII modes.

A tone Modulated CW mode turns your VHF FM rig into a CW transceiver for a new fun mode. It's perfect for transmitting code practice over VHF FM.

An AFSK CW mode lets you ID in CW.

The CW receive mode lets you copy from 1 to 99 WPM. Even with sloppy fists you'll be surprised at the copy you'll get with its powerful built-in software.

You also get a random code generator that'll help you copy CW faster.

Weather FAX

***You'll** be fascinated as you watch WEFAX signals blossom into full fledged weather maps on your printer.* Other interesting FAX pictures can also be printed -- such as some news photographs from wire services.

Any Epson graphics compatible printer will print a wealth of interesting pictures and maps.

Automatic sync and stop lets you set it and leave it for no hassle printing.

You can save FAX pictures and WEFAX maps to disk if your terminal program lets you save ASCII files to disk.

Pictures and maps can be *printed to screen in real time or from disk* on IBM and compatibles with the MFJ-1284 Starter Pack.

You can transmit FAX pictures right off disk and have fun exchanging and collecting them.

Slow Scan TV

The MFJ-1278 introduces you to the exciting world of slow scan TV.

You'll not only enjoy receiving pictures from thousands of SSTVers all-over-the-world but you can send your own pictures to them, too.

You can print slow scan TV pictures on any Epson graphics compatible printer. If you have an IBM PC or compatible you can print to screen in near real time or from disk with the MFJ-1284 Starter Pack.

You can transmit slow scan pictures right off disk -- there's no need to set up lights and a camera for a casual contact.

You can save slow scan pictures on disk from over-the-air QSOs if your terminal program lets you save ASCII files.

The MFJ-1278 transmits and receives 8.5, 12, 24, and 36 second black and white format SSTV pictures using two levels.

Contest Memory Keyer

***Nothing** beats the quick response of a memory keyer during a heated contest.*

You'll score valuable contest points by completing QSOs so fast you'll leave your competition behind. And you can snag rare DX by slipping in so quickly you'll catch everyone by surprise.

You get iambic operation with dot-dash memories, self-completing dots and dashes and jamproof spacing.

Message memories let you store contest RST, QTH, call, rig info -- everything you used to repeat over and over. You'll save precious time and work more QSOs.

You get automatic incrementing serial numbering. In a contest it can make the difference between winning and losing.

A weight control lets you penetrate QRM with a distinctive signal or lets your transmitter send perfect sounding CW.

More Features

Turn on your MFJ-1278 and it sets itself to match your computer baud rate. Select your operating mode and the correct modem is automatically selected.

***Plus** . . .* printing in all modes, threshold control for varying band conditions, tune-up command, lithium battery backup, RS-232 and TTL level serial ports, watch dog timer, FSK and AFSK outputs, output level control, speaker jack for both radio ports, test and calibration software, Z-80 at 4.9 MHz, 32K EPROM, and socketed ICs. FCC approved. 9x1½x9½ inches. 12 VDC or 110 VAC.

Get yours today and join the fun crowd!

FOR YOUR NEAREST DEALER
or to order call toll free
800-647-1800

One Year Unconditional Guarantee

MFJ

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
601-323-5869 **Telex:** 53-4590 MFJSTKV

MFJ . . . making quality affordable

CIRCLE 24 ON READER SERVICE CARD

Welcome, Newcomers!

Why Just VHF Antennas?

VHF is not just a name for the band of TV channels from 2 to 13. It means Very High Frequency and it applies to that band of frequencies from 30 MHz to 300 MHz. Of course, the frequencies for TV channels 2–13 are contained in this range, as well as many other services. The amateur radio service has three VHF **bands**, as well as many bands above VHF.

73 Magazine has in the past devoted issues to antennas covering the whole **radio frequency spectrum**. The subject of antennas has become so broad, however, that we can't begin to do justice to its entirety in a single issue. Therefore, this issue deals with VHF-and-above antennas, and the September issue will deal with antennas for 30 MHz and below.

From Heah to Theah

Why divide the spectrum at 30 MHz? The reason is that **propagation** characteristics change radically at around 30 MHz. The **ionosphere** refracts waves below 30 MHz back to Earth, which in turn reflects the waves back to the ionosphere. Waves often travel around the Earth in this vertical zig-zag pattern. It is this kind of propagation—**sky wave** propagation—which allows us to hear trans-continental short wave stations and distant AM stations at night.

Waves above 30 MHz usually pierce the ionosphere and zip out into the cosmos. Unsuspecting alien societies in different solar systems may hear all about a VHFer's new rig or the latest Star Trek film. Earth-bound VHFers, however, have to hear about it via the **tropospheric wave**, a wave useful only when there is a direct clear path between the transmitter and receiver. This is the kind of propagation used for television, or between a ham's mobile transmitter and a **repeater**. Normally, only line-of-sight tropospheric propagation is available to VHF and UHF enthusiasts.

However . . .

One late spring night I was watching Channel 5 on TV, which normally receives a Boston station located about 80 miles away. All of a sudden I was hearing (though not seeing well) strictly Canadian news. After a few minutes, the TV station identified its location as Ottawa—over 300 miles away! For a brief period, its signal overrode the Boston station located a quarter of the distance away. How could this happen?

We chose this month for VHF-and-above antennas for a very good reason. The spring and summer in the Northern hemisphere, with all its active weather, creates conditions that allow VHF tropo waves to propagate well beyond line-of-sight—sometimes thousands of miles!

The most common **DX** VHF propagation mode is **tropospheric bending and ducting**. The Ottawa television station came into southwestern New Hampshire through a tropo duct.

Another useful mode is **sporadic E**, in which signals are bounced from ionized patches of the ionosphere's E layer. Aurora are disturbances in the Earth's ionosphere and magnetosphere, and they will also support VHF and UHF propagation. When meteors enter the Earth's atmosphere they produce ionized trails of gas that VHF and UHF signals bounce from. Meteor scatter isn't for everyone, but we show you how to do it in this issue. Moonbounce or EME (Earth-Moon-Earth) is an even more exotic way to get distance on VHF. For those who choose to investigate, VHF-and-above offers a lot more than a line-of-sight link to the local repeater.

Go Forth and Propagate

Fascinated with VHF-and-above propagation and antennas? There are many fine sources of information levels on this, several here in *73*. Arliss Thompson's "Aerial View" column for is an excellent monthly antenna tutorial. Pete Putman's "Above and Beyond" column discusses the latest happenings in the world of VHF and above, and is ideal for those beyond the beginner level.

Hope to see you on the higher bands!

. . . de KA1HY

GLOSSARY

Radio frequency spectrum—The portion of the electromagnetic wave spectrum which covers waves whose wavelengths range from 30 kilometers to 1 millimeter. The corresponding frequencies are 10,000 cycles/second (10 kHz) to 3000 billion cycles/second (3000 GHz).

Propagation—The transfer of energy through a medium, such as the atmosphere, or through space.

Ionosphere—An upper-atmosphere layer, ranging 75–200 miles above the Earth's surface. So called because molecules at that level are ionized (i.e., they lose electrons) by solar radiation.

Sky Wave—A radio wave that travels up to the ionosphere and is refracted back to Earth. A single skip sky wave—one that is refracted just once by the ionosphere can travel up to several thousand miles. They are mainly responsible for world-wide radio communications.

Tropospheric Wave—A wave that travels through the troposphere, the lower part of the atmosphere that extends up to six miles from the Earth's surface.

Repeater—A machine that receives a signal and simultaneously retransmits it on a different frequency. They are normally used to extend the range of line-of-sight signals. They are very popular for mobile-to-mobile VHF-and-above communications.

DX—Means "Long Distance." The distance that qualifies as DX varies from band to band. VHF-and-above DX are distances well beyond the range of line-of-sight.

Tropospheric bending and ducting—The condition where radio waves are refracted when passing between two atmospheric layers in the troposphere that have sharply contrasting temperatures and moisture contents. A duct is formed by a layers of air with different propagation characteristics. Often moist cool air sits over warm dry air, which in turn sits on the Earth. Since the wave is refracted by the moist, cool air layer, and reflected by the Earth, the warm dry air layer acts as the duct, or waveguide. Waves of up to 10,000 MHz have travelled hundreds of miles by ducting. Ducted VHF waves have been detected from several thousand miles away!

Sporadic E—This is propagation whereby sky waves are refracted by dense patches of ions in the E-layer of the ionosphere. Waves up to 430 MHz are known to have been propagated via sporadic E. Since this layer is in the lower ionosphere, wave skip distances are shorter (typically 400–1300 miles). Also known as "short skip."

73 AMATEUR RADIO

MARCH 1988 Issue # 330

STAFF

PUBLISHER
Wayne Green W2NSD/1
ASSOCIATE PUBLISHER
Stuart Norwood

EDITOR-IN-CHIEF
Larry Ledlow, Jr. NA5E
MANAGING EDITOR
Gisela Bickford
SENIOR EDITOR
Bryan Hastings KA1HY
TECHNICAL EDITOR
Larry Antonuk WB9RRT
COPY EDITOR
Rebecca Niemela
INTERNATIONAL EDITOR
Richard Phenix
ART DIRECTOR
Bob Dukette
GRAPHIC DESIGN MANAGER
Deborah Smith
GRAPHIC DESIGNER
Marilyn Moran
ASSOCIATES
Mike Bryce WB8VGE
John Edwards KI2U
Leon Fletcher N6HYK
Bill Gosney KE7C
Jim Gray W1XU
Chod Harris VP2ML
Dr. Marc Leavey WA3AJR
Brian Lloyd WB6RQN
Andy MacAllister WA5ZIB
Bill Pasternak WA6ITF
Peter Putman KT2B
Mike Stone WB8QCD
Dr. Ralph Taggart WB8DQT
Arliss Thompson W7XU

ADVERTISING
1-603-525-4201
1-800-225-5083
SALES MANAGER
Sam Greene
ADVERTISING SALES
Ed Verbin
SALES SERVICES MANAGER
Hope Currier

WGE PUBLISHING, INC.
CHIEF FINANCIAL OFFICER
Tim Pelkey
CIRCULATION DIRECTOR
Rodney Bell
TYPESETTING/PAGINATION
Bob Dukette, Systems Supervisor
Steve Jewett KA1MPM, Linda Drew, Susan Allen
GRAPHICS SERVICES
Richard Clarke, Manager
Sue B. Flanagan, Dan Croteau, Jodi Johnson

Editorial Offices
WGE Center
Peterborough, NH 03458-1194
603-525-4201

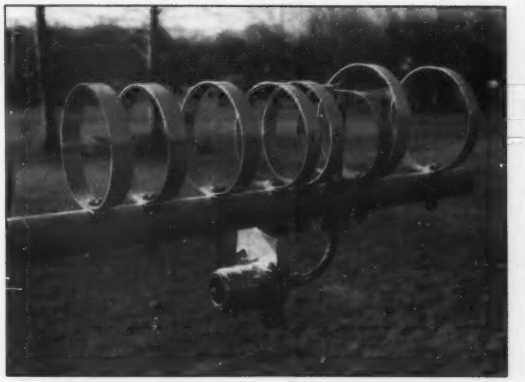
Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio (ISSN 0889-5309) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.

Entire contents © 1988 by WGE Publishing, Inc. No part of this publication may be reproduced without written permission from the publisher.

TABLE OF CONTENTS

FEATURES



4 **Welcome, Newcomers!**
Why just VHF antennas KA1HY

12 **Winnebiko**
A close look at Winnebiko's 2meter lifeline N4RVE

14 **10meter Beam**
With a little money you can gain a lot ..... NOBLX

20 **Heath SB-200/220 Mod**
More mileage out of a workhorse amp VE5XZ

22 **Ten Meter Meteor Scatter**
DXing with a difference WB5KYK

28 **Mobile Antenna**
Two meters on a broadcast band antenna! W4JC

34 **Antennas in the Spring** Spring cleaning above the roof line WA4BLC

35 **4 Element Yagis** Beams in the balance—both are for you KT2B

50 **Telegraph Trail, *Part 2*** A telegraphic trip through time W6CK

REVIEWS

11 **Down East Microwave** Two loop yagis for the hard-to-please KT2B

16 **Create an X-209 Yagi** This 9-element rates a 10 ..... KT2B

26 **Larsen HT Antennas** HT antennas for every occasion W7XU

27 **Book Reviews** Something for everyone WB9RRT

31 **Comrade Untenna and Power Booster** This package packs a punch KA1HY

37 **Book Review** Transmitter hunting KA9KAF

38 **Datong Direction Finder** High-tech transmitter tracking WA4BLC

42 **MAXCOM** The name says it all W7XU

DEPARTMENTS

FEEDBACK... FEEDBACK!
It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 89. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.

75 Above and Beyond
88 Ad Index
62 Aerial View
54 ATV
59 Barter and Buy
96 Circuits
87 Dealer Directory
85 DX
89 Feedback Card
86 Fun!
64 Hamsats
74 Index: 3/88
102 Letters
99 Looking West
6 Never Say Die

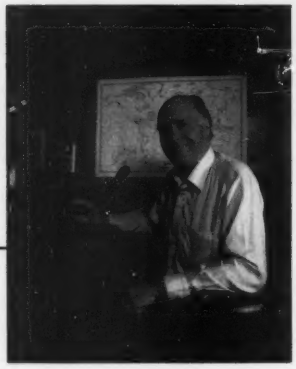
47 New Products
103 Op Ed
77 Packet Talk
60 Propagation
73 QRP
9 QRX
100 QTH
81 RTTY Loop
90 73 International
68 Special Events

Cover design and illustration by Deborah Smith.

Number 2 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1



Running for VP? That's Crazy!

Maybe.

No, of course I don't expect to win. The chances of that are beyond calculation. Heck, if the chances were good, I wouldn't do it. Which vice president said the job was as interesting as a bucket of warm spit?

It's not that I'm tilting at windmills. I hope the platform of running for vice president in the New Hampshire primary will give me an opportunity to get across a message I think is important.

In my editorials I have been railing against the way America has sunk to second in world financial strength. I've been worrying about our loss of consumer electronic industries to Japan. Being a solution-oriented person, I believe I have some worthwhile ideas on ways to get our country back to #1.

As a candidate for national office I have an opportunity to discuss my proposed solutions to America's problems and get them heard. As a result I've been interviewed by papers all around the country—have appeared on a number of radio interview shows—and have been asked to speak to service clubs. The plan is working.

High-Tech Education

I've written in my 73 editorials about some of my ideas on how to get America back to #1. One key area is to improve our educational system, which sure could stand it. Here I have a number of proposals for ways to increase educational productivity. But the most basic concept is to start teaching every child in America the fundamentals of electronics, including communications and computers. This would be supported by a concerted effort to get kids involved with high-tech hobbies such as amateur radio, computers, electronic experimenting and science fair projects. We could use the young hams, that's for sure.

If you've kept up with communications technology, you know that everything is going digital. Even TV is going digital. Business communications today involve much more than telephones. Today's office phone systems are highly complex digital communications systems, with all sorts of features. Indeed, old timers find they have to be retrained on how to use their phones every week or so.

Business communications now include the widespread use of facsimile, copy machines, telephone answering systems, pagers, cellular telephones, business car radio, satellite links, computerized bulletin boards, 800-numbers, Telex, data and communications services such as MCI, Compuserve and The Source.

Both home and businesses are trying to cope with CD, CDI, VDI, DAT, 8mm video, VHS-C, S-VHS, digital VCRs, HDTV and so on. Soon we'll be up to here in superconductivity oriented products, fibre optics and other technologies light years ahead of anything we're seeing in amateur radio. Yet even so, I believe amateur radio is a great medium for getting kids interested in technology, so I'm willing to open myself to the ridicule I know I'll get from the other ham magazines. It's a small price to pay if I can get across my message to the American public.

Business Incentives and More

In addition to revamping our educational system—bringing it into the 20th century and cutting college costs by 70%—I'm also a big fan of changing our tax structure so small businesses will be better able to compete with foreign companies—so we won't have to turn to Asia for cheaper manufacturing in order to be competitive.

Further, I believe we can cut both military and government costs substantially by setting up a whistle-blowing commission. The people in government see the ways money is wasted and would love to blow the whistle—if it could be done without their sacrifice. I've been getting earfulls from hams working for the government.

Continued on page 69

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

QRM

Editorial Offices
WGE Center
Peterborough NH 03458-1194
phone: 603-525-4201

Advertising Offices
WGE Center
Peterborough NH 03458-1194
phone: 800-225-5083

Circulation Offices
WGE Center
Peterborough NH 03458-1194
phone : 603-525-4201

Manuscripts

Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. A premium will be paid for accepted articles that have been submitted electronically (CompuServe ppn 70310,775 or MCI Mail "WGEPUB") or on disk as an IBM-compatible ASCII file. All contributions should be directed to the *73* editorial offices. "How to Write for *73*" guidelines are available upon request. US citizens must include their social security number with submitted manuscripts.

Reprints: The first copy of an article—$3.00 (each additional copy–$1.50). Write to 73 Amateur Radio Magazine, WGE Center, Rt. 202 North, Peterborough, NH 03458. ATTN: Article Reprints.

Subscription Information

One Year (12 issues) $24.97; Two Years (24 issues) $44.98. Canada, Mexico and Foreign Surface: One Year $31.75 (US Funds); Two Year $57.00 (US Funds). Foreign Airmail: One Year $39.00 (US Funds); Two Years $70.00 (US Funds). Send new or renewal notices, inquiries, and change of address to 73 Amateur Radio, P.O. Box 931, Farmingdale NY 11737. Allow 4-6 weeks for subscription and change of address processing. For Customer Service, call toll-free at 1-800-227-7585. For renewals and changes of address, please include the address label from your most recent issue of 73. For gift subscriptions, include your name and address as well as those of the gift recipients. Second class postage paid at Peterborough NH 03458, and at additional mailing offices. Canadian second class mail registration number 9566. Microfilm Edition—University Microfilm, Ann Arbor MI 48106.

Postmaster: Send address changes to 73 Amateur Radio, P.O. Box 931, Farmingdale NY 11737.

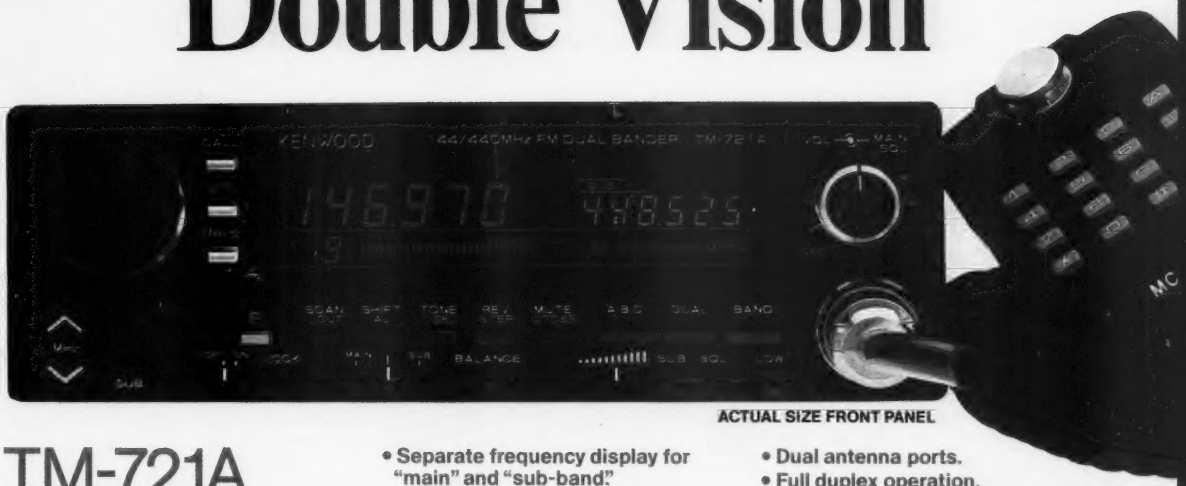
Contract: Too bad—merely reading this is a binding contract between you and the publisher. To get more pages for *73*, more advertising is necessary. To get more adveritsing, more readers are needed. You hereby agree to be an official *73* subscription agent. You will tell every ham you contact that you read about him in *73* this month so he'll rush out to buy a copy. It's just a little Green lie, so stop sweating. It'll work. He'll frantically read every word in the magazine, discovering its magnificence in the process. Look, if reason doesn't work we'll have to use subterfuge.

KENWOOD

pacesetter in Amateur Radio

ALL NEW!

Double Vision



ACTUAL SIZE FRONT PANEL

TM-721A

Deluxe FM dual bander

The Kenwood TM-721A re-defines the original Kenwood "Dual Bander" concept. The wide range of innovative features includes a dual channel watch function, selectable full duplex operation, 30 memory channels, extended frequency coverage, large multi-color dual digital LCD displays, programmable scanning, and more with 45 watts of output on VHF and 35 watts on UHF. TM-721A—Truly the finest full-featured FM Dual Band mobile transceiver!

- **Extended receiver range** (138.000-173.995 MHz) on 2 meters; 70 cm coverage is 438.000-449.995 MHz. (Specifications guaranteed on Amateur bands only. Two meter transmit range is 144-148 MHz. Modifiable for MARS/CAP. Permits required.)
- **30 multi-function memory channels.** 14 memory channels and one call channel for each band store frequency, repeater offset, CTCSS, and reverse. Channels "A" and "b" establish upper and lower limits for programmable band scan. Channels "C" and "d" store transmit and receive frequencies independently for "odd splits."
- **Separate frequency display for "main" and "sub-band."**
- **45 Watts on 2 meters, 35 watts on 70 cm.** Approx. 5 watts low power.
- **Call channel function.** A special memory channel for each band stores frequency, offset, and sub-tone of your favorite channel. Simply press the CALL key, and your favorite channel is selected!
- **Automatic Band Change (A.B.C.)** Automatically changes between main and sub-band when a signal is present.
- **Dual watch function allows VHF and UHF receive simultaneously.**
- **CTCSS encode/decode selectable from front panel** or UP/DWN keys on microphone. (Encode built-in, optional TSU-6 needed for decode.)
- **Balance control and separate squelch controls for each band.**
- **Dual antenna ports.**
- **Full duplex operation.**
- **Programmable memory and band scanning, with memory channel lock-out and priority watch function.**
- **Each function key has a unique tone for positive feedback.**
- **Illuminated front panel controls and keys.**
- **Dimmer control.**
- **16 key DTMF mic. included.**
- **Handset/remote control option (RC-10).**
- **Frequency (dial) lock.**
- **Supplied accessories:** 16-key DTMF hand mic., mounting bracket, DC cable.

Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features, and prices are subject to change without notice or obligation.

TM-721A shown with optional RC-10.

Optional Accessories:
• **RC-10** Multi-function handset/remote controller • **PS-430** Power supply • **TSU-6** CTCSS decode unit • **SW-100B** Compact SWR/power/volt meter • **SW-200B** Deluxe SWR/power meter • **SWT-1** 2m antenna tuner • **SWT-2** 70 cm antenna tuner • **SP-40** Compact mobile speaker • **SP-50B** Deluxe mobile speaker • **PG-2N** DC cable • **PG-3B** DC line noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MA-4000** Dual band mobile antenna (mount not supplied) • **MB-11** Mobile bracket • **MC-43S** UP/DWN hand mic. • **MC-48B** 16-key DTMF hand mic.

KENWOOD

KENWOOD U.S.A. CORPORATION
2201 E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745

KENWOOD

...pacesetter in Amateur Radio

Good for Satellite Digital QSOs

Matching Pair

Look for FUJI and PHASE III-C

TS-711A/811A VHF/UHF all-mode base stations

The TS-711A 2 meter and the TS-811A 70 centimeter all mode transceivers are the perfect rigs for your VHF and UHF operations. Both rigs feature Kenwood's new Digital Code Squelch (DCS) signaling system. Together, they form the perfect "matching pair" for satellite operation.

- **Highly stable dual digital VFOs.** The 10 Hz step, dual digital VFOs offer excellent stability through the use of a TCXO (Temperature Compensated Crystal Oscillator).
- **Large fluorescent multi-function display.** Shows frequency, RIT shift, VFO A/B, SPLIT, ALERT, repeater offset, digital code, and memory channel.
- **40 multi-function memories.** Stores frequency, mode, repeater offset, and CTCSS tone. Memories are backed up with a built-in lithium battery.

- **Versatile scanning functions.** Programmable band and memory scan (with channel lock-out). "Center-stop" tuning on FM. An "alert" function lets you listen for activity on your priority channel while listening on another frequency. **A Kenwood exclusive!**
- **RF power output control.** Continuously adjustable from 2 to 25 watts.
- **Automatic mode selection.** You may select the mode manually using the front panel mode keys. Manual mode selection is verified in International Morse Code.
- **All-mode squelch.**
- **High performance noise blanker.**
- **Speech processor.** For maximum efficiency on SSB and FM.
- **IF shift.**
- **"Quick-Step" tuning.** Vary the tuning characteristics from "conventional VFO feel" to a stepping action.
- **Built-in AC power supply.** Operation on 12 volts DC is also possible.
- **Semi break-in CW, with side tone.**
- **VS-1 voice synthesizer (optional)**

More TS-711A/811A information is available from authorized Kenwood dealers.

Optional accessories.

- IF-10A computer interface
- IF-232C level translator
- CD-10 call sign display
- SP-430 external speaker
- VS-1 voice synthesizer
- TU-5 CTCSS tone unit
- MB-430 mobile mount
- MC-60A, MC-80, MC-85 deluxe desk top microphones
- MC-48B 16-key DTMF, MC-43S UP/DOWN mobile hand microphones
- SW-200A/B SWR/power meters: SW-200A 1.8-150 MHz SW-200B 140-450 MHz
- SWT-1 2-m antenna tuner
- SWT-2 70-cm antenna tuner
- PG-2U DC power cable

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

KENWOOD

KENWOOD U.S.A. CORPORATION
2201 E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745

QRX . . .

EDITED BY BRYAN HASTINGS KA1HY

Novice Enhancement

This month marks the anniversary of Novice Enhancement. Fred Maia of *W5YI News* sums up below the effect of Novice Enhancement for 1987.

The increase in the total number of ham radio operators is due to expansion at the Novice and Technician level. The total amateur census—the net increase of hams—increased by 9,119 in fiscal year 1987 (10/86 to 10/87). The Novice and Technician ranks swelled by a net 9,157! These figures show the General, Advanced, and Extra-class ranks suffered a net decrease.

12,708 applicants became Novices in the period from April–October 1986. 16,304 applicants became Novices in the same period in 1987. This is a 28.3% increase.

Novice Enhancement is clearly working.

33cm Band Threat

At this time, 902–928 MHz is assigned to all amateurs, except Novice Class, for CW, Voice, SSTV, and FAX. Amateur radio is in considerable danger, however, of losing this band to commercial interests. The FCC has proposed (General Docket 87-389) opening up the band to license-free consumer "broadcasting." Such broadcasting includes remote devices for home appliances, such as TVs, stereos, VCRs, and CD players.

Radio Electronics, a leading electronics magazine, responded quickly to the FCC proposal. Brian Fenton, the Managing Editor, wrote in an editorial in the January 1988 issue, "The electronics industry would benefit tremendously from the new markets opened up. The license-free band could open up new horizons in home automation, eliminating cables between video cameras, stereo speakers, etc. Needless to say, however, there will be many problems to overcome before the band can come into use. Interference from amateur radio and government agencies that currently use the band is only one of them."

It's interesting to note that the proposed new applications are already in trouble because of possible interference from amateur radio!

The amateur radio community must take action to secure 33cm. *73 Magazine* encourages—nay, *exhorts*—readers to respond to this issue. Let us and the FCC hear from you!

Kowalski Resigns

FCC Special Services Division Chief Raymond Kowalski tendered his resignation effective January 3, 1988. Kowalski served the past six years as the overseer of all the Commission's regulatory efforts in the amateur radio service. He left his post to accept a position on the legal staff of the prestigious law firm of Blooston and Morkofski. No successor has yet been named.

Haller Appointment

Ralph A. Haller N4RH is the new Chief of the FCC's Private Radio Bureau (PRB). Haller replaces Robert T.N. Fitch who recently became the Senior Legal Advisor to the Chairman of the FCC.

Haller has become the highest-ranking FCC official who is also an amateur. The Private Radio Bureau answers directly to the FCC Chairman and to the FCC Office of Managing Director. The Special Services Division, the office from which Ray Kowalski just resigned as Chief, answers to the PRB.

Haller worked as chief engineer and announcer for several broadcast stations in Kansas before joining the FCC's staff. He was also a partner with Broadcast Consulting Services, a Topeka engineering firm.

Haller joined the FCC in 1971 as a radio inspector in the Los Angeles District Office. In 1976, he moved to Washington D.C. to accept a position with the FCC's Field Operations Enforcement Bureau. He held several other positions with the Commission until he became deputy chief of the PRB in 1986.

Ralph, an Extra-Class licensee, helped pioneer the implementation of the All-Volunteer Amateur Testing program.

New Phone Patch Rates

Repeater trustees in 4- and 5-land just received good news. Southwestern Bell recently amended their criteria for classifying the type of service charges for phone patch lines. This makes it much easier for a repeater to be classified residential instead of commercial, which cuts service charges in half. These two hindering stipulations to class a repeater residential have been dropped:

•Service cannot be co-located with business service; and
•Service must not be located in an area zoned for commercial only

The following are the only stipulations now to classify a repeater "residential:"

•Amateur use only;
•No advertising;
•No business functions performed; and
•Not located in a public meeting place

Anyone wishing to know about the events leading up to this decision may contact Paul Gilbert KE5ZW, 210-38th St., Snyder TX 79549, (915) 573-2163. This decision sets a very important precedent for repeater classification.

Canada ARS Restructuring

Canadian Amateurs eagerly await the new regulations on the restructuring of the Amateur Radio Service. A Regulatory Impact Analysis Statement will accompany the new rules. If there is little comment, the new amateur rules will go into effect after allowing some months for amateurs and others to adjust to the changes. Canada will likely adopt an entry-level Certificate "B" all-mode "Basic Amateur" license that will not require code.

W7PHO SK

Well-known DXer Bill Bennett W7PHO died at his Seattle home early on Wednesday, December 23rd. Bill was probably best known as the founder and moderator of the W7PHO Family Hour Net.

Still No Instant Novice

The FCC has denied a petition, RM 5924, filed by KJ4JE, which requested that a Novice examinee begin operating immediately by using a temporary callsign consisting of the callsign of one of the volunteer examiners plus a unique numeral. The FCC said that the application processing period is not unreasonable and that the instant licensing proposal appears to be contrary to international radio law.

Thanks!

to the news items contributors this month. They are *Westlink*, *W5YI Report*, *The ARRL Bulletin*, *The Chattering Relay*, and Paul Gilbert KE5ZW. Keep your ham radio-related news, graphics and photos rolling in to: *73 Magazine*, WGE Center, 70 Rt. 202N, Peterborough NH 03458-1194. Attn: QRX.

KENWOOD

pacesetter in Amateur Radio

NEW!

Compact Breakthrough!

TH-25AT/45AT

New Pocket Portable Transceivers

The all-new TH-25 Series of pocket transceivers is here! Wide-band frequency coverage, LCD display, 5 watt option, plus...

- Frequency coverage: **TH-25AT:** 141-163 MHz (Rx); 144-148 MHz (Tx). (Modifiable for MARS/CAP. Permits required.)
  TH-45AT: 438-450 MHz.
- Automatic Power Control (APC) circuit for reliable RF output and final protection.
- 14 memories; two for **any** "odd split" (5 kHz steps).
- Automatic offset selection (TH-25AT).
- 5 Watts from 12 VDC or PB-8 battery pack.
- Large multi-function LCD display.
- Rotary dial selects memory, frequency, CTCSS and scan direction.
- T-ALERT for quiet monitoring. Tone Alert beeps when squelch is opened.
- Band scan and memory scan.
- Automatic "power off" circuit.
- Water resistant.
- CTCSS encoder optional (TSU-6).
- **Supplied accessories:** StubbyDuk, PB-5 battery pack for 2.5 watts output, wall charger, belt hook, wrist strap, water resistant dust caps.

Optional accessories:

• **PB-5** 7.2 V, 200 mAh NiCd pack for 2.5 W output • **PB-6** 7.2 V, 600 mAh NiCd pack • **PB-7** 7.2 V, 1100 mAh NiCd pack • **PB-8** 12 V, 600 mAh NiCd for 5 W output • **PB-9** 7.2 V, 600 mAh NiCd with built-in charger • **BC-10** Compact charger • **BC-11** Rapid charger • **BT-6** AAA battery case • **DC-1/PG-2V** DC adapter • **HMC-2** Headset with VOX and PTT • **SC-14, 15, 16** Soft cases • **SMC-30/31** Speaker mics. • **TSU-6** CTCSS decode unit • **WR-1** Water resistant bag

KENWOOD

KENWOOD U.S.A. CORPORATION
2201 E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745

Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features, and prices are subject to change without notice or obligation.

73 Review *by Pete Putman KT2B*

Down East Microwave
Box 2310, RD #1
Troy, ME 04987
Price Class: 3333-LY $93 Assembled/$77 Kit
1345-LY $80 Assembled/$67 Kit

Down East Microwave 3333-LYK 902 MHz and 1345-LYK 2304 MHz Loop Yagis

Great DXing on the higher bands and portable, too.

Looking for a high-gain, light wind-load antenna for microwave operation? Look no further. Down East Microwave, a specialty manufacturer located in Troy, Maine, makes a full line of loop yagis for the frequency range 900 - 3456 MHz. The antennas use the design pioneered by G3JVL and G8AZM. I procured two of these for permanent installation on the 33 and 13cm bands to go along with newly acquired transverters.

There is no mystery about loop yagi operation. They perform just like ordinary yagis, each with a driven element, reflector and directors. Full-wave elements, instead of conventional half wavelength dipole elements, make these antennas stand out. The antennas exhibit high forward gains and good front to back ratios.

Quality Construction

The 902 MHz yagi consists of 33 elements, while the 2304 MHz version has 45. Both have two reflectors. Photo A shows the elements directly behind the driven element of the 1345LY. Miniature hardline feeds the full wavelength driven element from a female N connector mounted on the boom. Incidentally, slightly flattening the driven element provides the best match to a 50Ω line. The remainder of the parasitic elements are aluminum symmetrical loops fastened to the boom with stainless steel hardware.

The booms are made from extremely rigid 6061-T6 aluminum. The loops are fabricated from ½" width (902) and ¼" width (2304) medium-gauge material that bends with some resistance but holds its shape. Antenna lengths and boom material permit installation on a 1" diameter mast without boom braces.

The yagi kits come shipped in two parts: the boom sections and the element/bracket kit. Complete instructions come with the antennas, including a helpful pictorial diagram. Many of the directors are of the same length and they are prebent and sorted into bags containing identifying numbers. This thought really speeds up assembly. A ¼" nut driver and fingers are the only tools required. Assembly time for each yagi is about one hour. Be careful not to over-tighten the hardware, or the loops will distort.

The flexible hardline comes pre-connected to a type N fitting, but it requires bending to connect to the driven element. The manufacturer suggests soldering the coax first, then gently bending the hardline back at 90 degrees to the element. The connector bracket will then easily attach to the boom.

Down East Microwave supplies stainless steel hardware for all fastenings except the boom-to-mast clamps, which are 1" galvanized U-clamps. The mounting bracket is a piece of aluminum plate stock bent at right angles. It fastens through the boom at the balance point, and a hole has been drilled out to clear the director it lies under. This makes a very secure and rigid support. I mounted the antennas on a homebrew aluminum "trident" frame (Photo B).

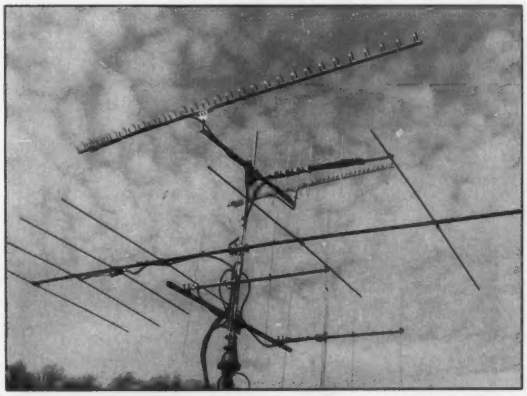


Photo A. Closeup of the 903 MHz feedpoint. Note the two directors behind the slightly flattened driven element. The driven element does not make a complete loop.

Down East Loop Yagi Technical Specifications

Specification	3333-LYK	1345-LYK
Frequency Range	860-910 Mhz	2.2-2.35 Ghz
Number of Elements	33	45
Boom Length	12'	6'9"
Weight	5 lbs	3 lbs
Gain	18.5 dBi approx.	21 dBi approx.
3 dB Beamwidth, E plane	20 degrees	16 degrees
Front/Back ratio	>20 dB	>20 dB

I'm Impressed

Neither antenna required adjustment for matching. At the time of this writing, I only had the 902 MHz loop yagi in service on an SSB Electronics LT-33S transverter. The LMW 2304 transverter was still under test, and I made preliminary 2304 MHz adjustments with an extremely low level RF source. The 902 MHz antenna showed a minimal amount of reflected power using 25 watts and a Bird 50E slug, which indicate the SWR was easily under 1.2:1 without adjustment. After several heavy rainstorms, the beaded water remaining on the loop elements did not have any effect on matching.

I have made contacts with the 902 loop yagi as far away as 50 miles using just 25 watts and easily copied the other station, which only used six watts. The manufacturer claims an E-plane 3 dB bandwidth of 20 degrees, and my on-the-air observations agree.

These light weight, strong, high-gain antennas for 902 and 2304 MHz from Down East Microwave represent good value. They use high quality materials and workmanship to produce quality products. I can recommend them for portable operation, too, since the loops are very rigid and can withstand moderate abuse. For great DXing on the higher bands, try the 3333-LYK or 1345-LYK loop yagis. 73

Two Meters Aboard the Winnebiko

An Essential Link for Dataspace

by Steven K. Roberts, N4RVE
(formerly KA8OVA)

I still remember my first attempt at a bicycle-mobile 2-meter installation: A battered Kenwood HT bungeed onto a handlebar pack with a speaker-mike clipped to my shirt. The antenna was a quarter-wave mag-mount Ty-rapped to the rear rack with a ten-foot coil of excess coax lashed to the frame. When the radio's internal batteries died, well, I was out of communication. A five minute installation job like that, while superficially entertaining, is guaranteed to fall apart under full-time use. There is no such thing as a trivial task where electronics are involved.

But my new bicycle-mobile 2-meter system is considerably more robust. Yaesu's multimode 290 is shock-mounted in the control console, as much a part of the bike as the 48-spoke wheels and 54-speed transmission. The rig is powered by two fully redundant solar-charged 5 amp-hour batteries, and it drives a Larsen half-wave antenna mounted to the seat back. Audio is piped to either the console speaker or an earpiece built into the helmet, and voice input is either a TT-mike plugged into the front panel or a preamplified electret boom mike attached to the earpiece. A push-to-talk button is embedded in the left handlebar grip under my thumb...and, as I mentioned in last month's introductory article of this series, the Yaesu is deeply integrated with a number of other onboard systems including touch-tone remote control, bike security, and packet.

Photo 1. Closeup of the Winnebiko's "Brain Interface Unit" and the black Larsen Kulrod™ Special antenna. The Bell Tourlite™ helmet houses a Plantronics headset, chosen for its ruggedness and resistance to moisture.

Rig Choice and Mounting

When it became clear that the transceiver would be permanently mounted in the bike's control console instead of just stashed in a pack, the choice of unit became critical. I quickly discovered that no HT could do the job, since the physical distribution and poor readability of controls and indicators would make installation awkward. This led me to consider automotive units, such as the attractive new ICOM IC-28.

But the problem here is power—rigs made for cars tend to run warm, wasting half an amp or more on standby. Since my on-board battery capacity of 10 amp-hours has to be shared with lights, computers, security, stereo, and dozens of other loads, automotive 2-meter rigs are unacceptable.

Yaesu, however, markets an interesting hybrid unit in the form of the FT-290R. As an over-the shoulder battery-powered portable, it draws only 100 mA in receive mode, feeding a rubber duckie out a front-panel BNC. But if you want an automotive rig, just unplug its battery pack, snap on a 25-watt amplifier, and hang it conventionally under the dashboard. Perfect! The complement of features is excellent, with ten memories, stored offsets, a call channel, low-power mode, various tuning steps, and so on—and its utility is enhanced by multimode capability (FM, SSB, and CW).

Of course, a rugged outdoor environment imposes some interesting packaging constraints. After puzzling over the problem for a while, I lined a front-panel cutout with channel rubber, supported the radio on a soft foam pad, and tied it down with four coil springs. A clear vinyl cover velcros over the console when the rains come, and the only problem with humidity so far has been in the helmet microphone assembly, far from the radio itself.

Audio I/O

It didn't take long to discover that a built-in helmet audio system is an absolute necessity—trying to handle a speaker-mike while pedaling, braking, shifting, steering, and binary-typing is too much of a juggling act. But here again I encountered problems with products made for typical consumer environments: lightweight boom headsets were

apparently not intended to be rained upon. Rain can have two deviation-killing effects: soaking up the high-impedance electret audio signal and wicking into the microphone tube.

It turns out, however, that a Plantronics headset does a quite passable job, especially if a foam ball is added to reduce wind noise and the capsule is sealed with lacquer to keep water out. The headset is mounted to my Bell Tourlite™ bicycle helmet via a baroque assemblage of brass, brazed in a moment of drunken inspiration by one of Eureka's premier kinetic sculptors. Shielded cables were routed between the styrofoam and the outer helmet shell, terminating in a 12-pin Lemo waterproof connector on the back that also carries stereo audio and power for the dimmable Sunburst "miners" lamp. (The net effect of all this is that I can be light-headed while listening to music and chatting electronically with local hams.)

Audio is carried from the brain-interface unit through an Autac coil cord into the bike's wiring harness, whereupon it enters the console system through another Lemo connector. Inside, an "audio nexus board" preamplifies the tiny mike signal with an LM324 and provides a convenient point for mixing in other modulation sources (touch tones, packet audio, speech synthesis output, and so on).

Because of the low levels involved in the mike circuit, this system does have a couple of problems. Sharp transients in adjacent harness wires appear on my transmitted signal, most notably those associated with the pulse-width dimmer of the helmet lamp and the 7" barricade flasher behind my head. A future modification will either change the microphone technology or add a preamp to the helmet.

Audio *out* of the radio, however, is easy. The Yaesu's speaker signal is piped into an audio bus structure, feeding the touch-tone receiver chip, the Pac-Comm packet TNC, a cassette deck, the console speaker, and the helmet. A separate mixer amp allows a variety of audio sources to serve this same bus so that, for example, people standing around the bike can hear synthesized speech ("Red alert! Biological life forms nearby..."), a sound generator chip, my voice carried over 2-meters, or a taped message—all through the console speaker.

Back at the helmet, I normally use the comfortable Plantronics ear insert, though I do have the option of piping the various sources into the stereo headphone channels to aid in spatial discrimination. A variation on this, published last year in *QST*, is in the process of being added to the HF system—comments in a later article of this series.

Antenna

I will not attempt to conduct a tutorial on 2m antenna selection here—I'll leave that black magic to RF engineers. I do have a couple of notes on the subject, however.

It is well-known that ½ wave antennas require little or no counterpoise, while ¼ and ⅝ units depend on them. Although a quarter-wave whip works OK on a massive recumbent bicycle (Maggie, KA8ZYW, uses one), the half-wave is dramatically more effective. In pre-launch tests, I found I could hit the familiar Columbus, Ohio, 147.24 machine from about 5 miles further away on the bike than with my ¼-wave-equipped car. That convinced me.

The antenna is a Larsen Kulrod™ Special, and I have to commend the company on a remarkably rugged product. For thousands of miles the base mount has served as a handle for schlepping this 275-pound machine through doorways, up gravel slopes, and across unridable expanses of puddled grasslands...

Push-to-Talk

The only rational place for the PTT switch in a properly installed bicycle-mobile 2m rig is on the handlebar. Unfortunately, due to moisture, the component choice is non-trivial.

I faced the same problem here I had with the handlebar keyboard, though I eventually moved on to rubber-booted elastomeric units for smooth text entry. The ideal PTT would seem to be a good waterproof miniature push-button... but have you ever tried to find one?

"There is no such thing as a trivial task where electronics are involved."

C&K has a "sealed" product, but they are only intended to survive one washing cycle during automatic assembly. They also have no hysteresis whatsoever, and thus quickly become flaky and intermittent when corrosion sets in. I finally settled on a military-surplus sealed Microswitch with a quarter-inch bushing, further protected by a miniature rubber boot from AME. All this is Ty-rapped to the handlebar's substructure, siliconed, and smoothed over by layers of sculpted foam.

On Maggie's bike we used an Omron miniature pushbutton with a C&K keycap epoxied on. Though it has very little travel, there is quite enough tactile feedback to provide a pleasant switching sensation.

Power

Every ham who has ever watched a hand-held radio abruptly die because of the power curve of internal NiCads is already acutely conscious of the problems with batteries. On the bike, the difficulties were compounded by a variety of loads, the need for redundancy, random charge/discharge cycles, and a lack of home-base spares. For the Argonaut in the trailer, I use a 4 amp-hour NiCad—I can run it down properly, give it a full solar charge, and hit the airwaves again. But for day-to-day 2-meter operation, I chose Gates starved-electrolyte lead-acid cells, packaged by PB Energy Options of San Mateo, CA.

I'll save the details of this for May's column, which will deal exclusively with the solar-charged 7-voltage power system on the bike. But as far as the Yaesu 290 is concerned, I have two 5 amp-hour batteries set up to drive a pair of 12-volt buses. Bus A runs computers, switching power supplies, and the like; bus B handles the radio and all lights. The logic here is that on long night rides I can live without the computers...switching battery A onto the B bus as a fresh backup when the low-voltage warning light starts to blink.

QRZ...Bicycle Mobile?

As I noted at the end of last month's feature, the Winnebiko's 2-meter rig has proven to be an essential component of my nomadic lifestyle. It keeps my relationship with Maggie healthy during times of road-stress, frees us to stray a few miles apart when scouting local resources, and—very significantly—opens doors across the land. Riding through Titusville last night, we were invited to an impromptu gathering at the local IHOP. Hailing the Brunswick, Georgia, repeater from the Hostel in the Forest a couple of weeks ago netted us an invitation to a delightful Christmas party...which turned into a 2-day stay. Everywhere we go, the ham community makes us feel at home.

If my bike-mobile HF and packet systems are a form of sophisticated play, then the 2-meter installation must be viewed as basic survival. And that's why a carefully integrated design pays off. For the same reason that you wouldn't wire a house with duct tape and extension cords, a ham station in daily use must be smooth and free from irritating kludges. Cheers from Florida, and see you next month...

NOTE: Steve's book, COMPUTING ACROSS AMERICA is now available ($12). For information about his book, or the quarterly publication of road tales "The Journal of High Treknowledgy" ($13), as well as CAA T-Shirts ($11), contact: Computing Across America, 1013 Warren Avenue, Cary, NC 27511.

Steve and Maggie are currently taking a break from full-time pedaling to do a book promotion tour with the bikes in a 35-foot converted school bus, which serves as their mothership. If you would like to invite them to appear at your local hamfest or club meeting, contact their manager, Paul Jaeger, at the above address or phone 919/467-4806.

To contact Steve directly, try the GEnie network as WORDY. Over 50 chapters of his on-going adventures and technical commentary are in an area called CAA. Access is $5/hour during evenings and weekends; to sign up, use your modem to call 800-638-8369 and type HHH when connected. At the U#= prompt, enter control-R followed by XJM11878,GENIE. The system will take you through a signup procedure. Have your checking account or credit card data ready.

The 10-Meter Beam for $4

Great returns for minimal money.

by Peter A. Bergman N0BLX

A title like this usually implies that the author has several PhD's and owns shares in the local aluminum tubing industry. The reader, in the end, is left with his enhanced Novice privileges, a wire dipole on 10 meters and a hole in his pocket. By way of contrast, this author just wants to share a success story on what to do with the gift of a non-working television antenna.

In the Beginning

It all began one day when the XYL walked into the shack and said, "Honey, I know that you are having a great time on ten meters but wouldn't it be better if you had a tri-band beam like those other guys? What do they cost?" My response elicited, "Oh! That much? And you'll need a bigger rotator?"

A good hard look at Orr's Handbook, [1] a re-examination of an old TV antenna, and a discovery trip to the junk pile in the woods with tape measure and pliers followed. Gold! Well, nearly as good: another (very bent) TV antenna, a ten foot pipe, and a five-and-a-half foot section of steel tee-stock.

The Handbook had a description of a two-element yagi that could give 5.5 dB of gain and a front-to-back ratio of 7 to 15 dB. The second element, the parasitic element, could become a reflector—in which case it should be about 5% longer than the driven element—or a director if cut about 5% shorter. Using the parasitic element as a director gives slightly more gain and the advantages of a shorter element with the mechanical advantages of reduced weight, turning radius and wind load.

The Handbook yielded the following formulas;

Driven Element Length (feet)
= 476 ÷ frequency (MHz)
Director Length (feet)
= 450 ÷ frequency (MHz)
and Element Spacing (feet)
= 120 ÷ frequency (MHz)

Assembling the Materials

A 28.400 MHz center frequency (the phone sub-band) required about 16′ 9″ for the driven element, 15′ 10¼″ for the director, and an element spacing of 4′ and 3″.

The $4 Ten-Meter Beam Materials List:
2 each junk TV antennas free
2 each 1½″ x 4″ u-bolts $1.80
1 each 100 pF variable cap. 1.00
Small nuts, bolts and Misc. 1.20
Total: $4.00
References:
1. Radio Handbook 21st Edition by William Orr W6SAI
2. ARRL Antenna Book, 1974 Edition

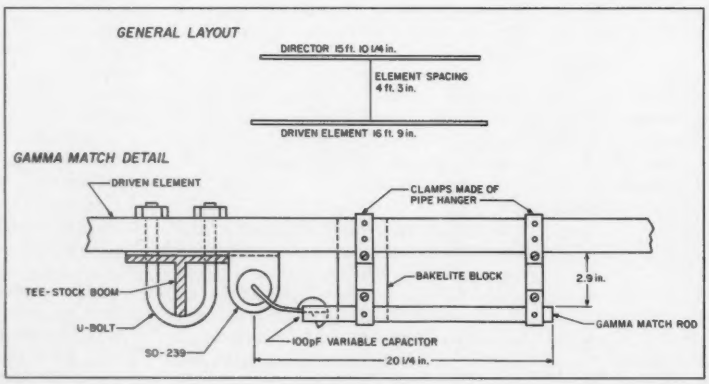


Figure 1. General antenna layout and Gamma match detail. #14 wire connects the SO-239 to the variable capacitor. The antenna resonates at 28.400 MHz. The SWR across the ten meter Novice band (28.1 to 28.5) ranges from 1.18:1 to 1.6:1.

Disassembly of the inherited TV antenna provided a 13′ piece of one-inch aluminum tubing; 10′ of one-inch galvanized pipe; a couple of pieces of ¾″ aluminum tubing 45″ long; and several pieces of ⅜″ aluminum tubing between 36 and 48″ long held together in pairs by mounting brackets. The harvest included a handfull of wing-nut bolts, a couple of bakelite blocks measuring 4″ by 2″ by ½″, two usable u-bolts with nuts and lockwashers, an assortment of little brackets, and two chunks of boom from the second antenna that could telescope into the water pipe.

The various bits and pieces laid out were evidence that a ten-meter mono-bander was about to take shape. If the new antenna would be small and light enough, that small TV rotator could handle the additional load.

A pair of the ⅜″ diameter tubes attached to each end of the 13′ former TV boom with ¼″-20 bolts yielded a driven element more than 17′ long. Connections with U-bolts enable length adjustments without cutting.

The ten-foot piece of pipe was stretched in similar manner. A couple of feet of aluminum tubing were telescoped into each end and secured with bolts before adding the former TV elements.

The tee-stock was next drilled to accommodate a two-foot triangle of counter-top material that had been "weather-testing" behind the clubhouse. After adding a pair of U-bolts, this assembly provided a secure mount to the mast.

Antenna Matching

Three methods of matching were available. The Delta-match would have required a matching section about

meters. My very meager junk box produced only one 100 picofarad variable capacitor. Back to the drawing board.

The Delta-match might be cheap, and the T-match might be a little bit more efficient, cheap—just one matching-rod one-third the diameter of the driven element and one variable capacitor.

A 20" scrap of aluminum close to the recommended diameter served as the matching rod. A pipe hanger strap became a clamp, and one of the bakelite blocks became a support for the driven end. The driven end of the rod was flattened and holes drilled to mount the capacitor. After final adjustments the capacitor was covered with a plastic vitamin bottle. Following the formula in the book, the Gamma-matching rod was spaced 1.70 of the length of the driven element from the driven element.

The Tuning Process

One of the numerous little brackets was reamed out to mount an SO-239 to the boom at its junction with the driven element. A short piece of #14 copper wire connected the center pin of the SO-239 to the stator of the capacitor. Soldering and clamping the coax directly to the antenna is a possibility, but the convenience of the connector is worth the 75 cents.

After assembling the antenna, a wooden step ladder served as a temporary mount for the tuning process. First, the antenna element lengths and spacing needed adjustment to optimize reception. Ideally, use a low-power transmitter feeding a dipole at the height of the antenna being adjusted and located several wavelengths away. otherwise, manually rotate the antenna to peak the signal strength of operators near the target frequency. Then trim the elements and adjust the spacing for signal improvement. If the reference signal fades, just hunt for another.

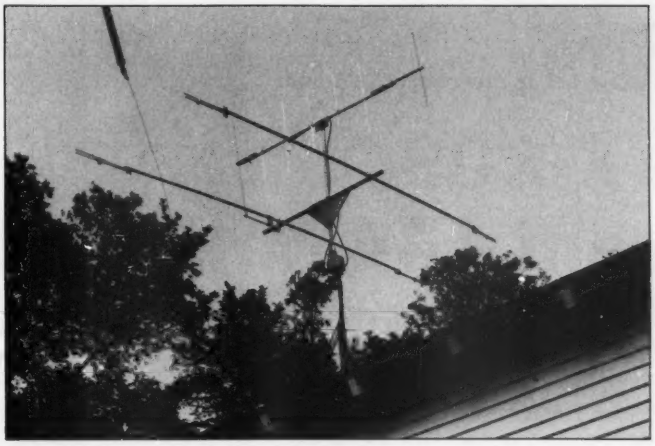


Photo A. The completed beam is in place a few feet below a two-meter antenna. The end detail of the driven element displays the spacing of the rods which affects the tuning. 1¼" at the ends works best.

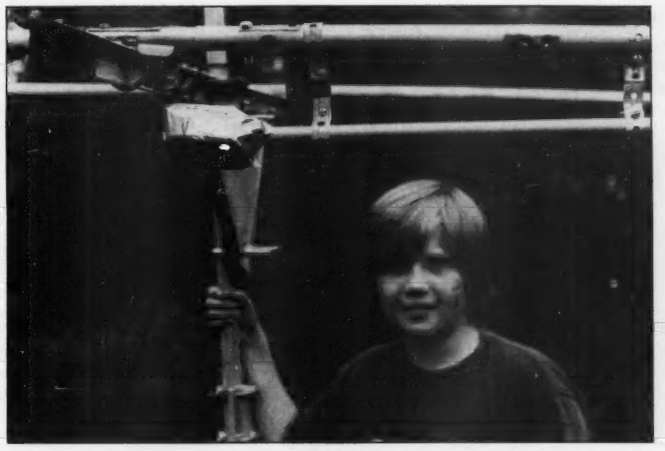


Photo B. Close-up of the Gamma match and the organic rotator. The variable capacitor has been covered with a plastic bottle and tape.

More and better test equipment makes transmitting adjustments more precise, but my Hot-Water 101 and a homebrew reflectometer served well. The Gamma rod clamp and the capacitor were adjusted for a maximum forward and a minimum reflected reading.

The antenna was installed at a height of 24 feet—only about 70% of a wave length above the ground and only 6% above the house. Yes, higher would have been better, but according to the Antenna Book $_2$ the wave angle could sometimes be as good as 20°.

Conclusions

Does it work? You bet! Stations barely heard with the dipole really peak up on the yagi. I get consistently better signal reports with the yagi, too. Some stations think I use an amplifier. Amplifiers are great, but they are more complex, more expensive, and do not help on receive. Comparing a beam with an amplifier, the former will definitely offer more bang for the buck.

It may not be the most technically sophisticated antenna around, but for $4 and a few afternoons of work with the family the returns are greater than can be measured on a signal-strength meter!

Want to improve your signal in and out? Scrounge around and build yourself a beam. Just avoid using two or three different types of metals, and get it up as high as possible—maybe build your own capacitor. Go ahead and try it. It could be the start of something big. ■

Peter Bergman can be reached at 902 NE 13th Ave. #15, Brainerd MN 65401. He is a jack of all trades who was attracted to ham radio because of its great public service potential.

73 Review by Pete Putman KT2B

Number 16 on your Feedback Card

Creative Design Co., Ltd.
Orion Hi-Tech
PO Box 8771
Calabasas CA 91302
Price Class: $119

Create X-209 9-Element 144 MHz Yagi

This medium-gain performer offers good design, light weight and great strength.

From Japan comes the Create 9-element "Long John" yagi for 2 meters. It's part of this company's growing product line in the USA. Distributed by Orion Hi-Tech in Calabasas, California, Creative Design Co. Ltd. offers a wide range of amateur products including rotors, towers, low-band antennas and even a unique log periodic antenna for 50–1300 MHz.

The X-209 is not really a "Long-John" design in the same sense as the old Hy-Gain models of the same name. It's a medium length (1.8 wavelength) yagi and offers about 14 dBi gain. The X-209 is a well-made antenna with some nice design touches.

CREATE X-209 "Long-John" 2m YAGI

Specification	Claimed	Measured
Forward Gain	14 dBi	n/a
F/B ratio	15 dB	14.5 dB
Sidelobe Rejection	n/a at-23 dB	
VSWR Bandwidth	4 MHz at 1.5:1	4 MHz at 1.3:1
Weight	8.25 lbs	n/m
Length	12' 2"	n/m

Easy and Secure Assembly

Photo A shows the assembled antenna. The first thing that grabs the eye is the unique boom. Its cross-section is neither round nor square, but more elliptical. The top and bottom of the boom—the sides parallel to the elements—are flat. The remainder of the boom is round. The effect is like putting a pipe in a vise and mashing it. The boom is also ribbed. It comes in two pieces, and the clamshell that holds them together is just a larger section of the same material, sawed in half and drilled out.

All of the elements come pre-assembled and fitted to a center plastic-covered magnesium alloy brace. Each brace fits to the flat side of the boom to ensure a snug fit (à la Tonna), and each is also drilled out to accommodate the mounting hardware. The nut and lockwasher fit snugly against the other flat boom side, so element placement is a snap. To make things easier, each of the parasitic elements is color-coded to facilitate assembly.

The driven element is completely encapsulated. In fact, the weather-proofed housing, which has a drain hole on one end., contains the driven element and its coaxial balun impedance match. Simply attach what looks like a large gray plastic tube to the boom and connect the coaxial cable. As a result, it took me only a half-hour to assemble the beam. Start with the longest elements at the rear and work forward. Directions aren't even necessary.

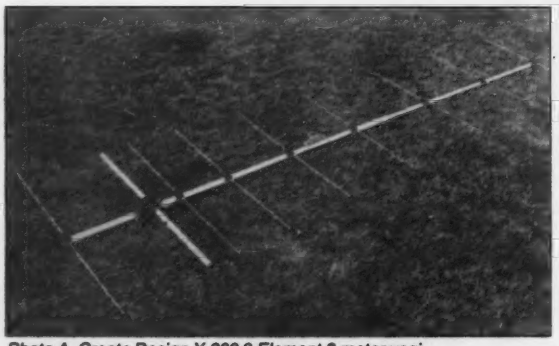


Photo A. Create Design X-209 9-Element 2-meter yagi.

Photo B. Close-up of the Create X-209 showing the encapsulated driven element.

The Manual

Most of the instructions pertain to stacking pairs of the X-209 or X-211 models. Very little information actually had anything to do with a single 9-element yagi. The manual could have been written more effectively, a problem not uncommon with even big-name manufacturers of imported equipment. This manual desperately needs a re-write, especially to reveal more pertinent information on the single X-209 yagi. The gain figures, F/B ratio, and polar plots are based on stacking two of these yagis.

The buyer should remove the assembly diagram and put the manual away somewhere. The driven element is sealed and cannot be adjusted. The elements are color-coded and go in place rapidly. It may take longer to attach the antenna to the mast then to build it!

Conclusion

I used the test set-up with the "quasi-tropic" radiator and 200 mW of power to make a few measurements. See the table for results.

The Create X-209 is a well-designed, lightweight antenna that is easy to assemble and very strong. It will yield satisfactory performance as a medium-gain yagi for either vertical or horizontal polarization modes.

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 30 PETERBOROUGH, NH 03458

POSTAGE WILL BE PAID BY ADDRESSEE

73 AMATEUR RADIO

P.O. Box 931
Farmingdale, NY 11737-9631

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 30 PETERBOROUGH, NH 03458

POSTAGE WILL BE PAID BY ADDRESSEE

73 AMATEUR RADIO

P.O. Box 931
Farmingdale, NY 11737-9631

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 30 PETERBOROUGH, NH 03458

POSTAGE WILL BE PAID BY ADDRESSEE

73 AMATEUR RADIO

P.O. Box 931
Farmingdale, NY 11737-9631

☐YES, I could use a little excitement in my hobby!

SPECIAL OFFER!

Send me 12 issues of *73* for the low subscription price of $19.97: save over $15 off the cover price! (Base sub rate: $24.97)

NAME _____ **CALL** _____

ADDRESS _____

CITY _____ **STATE** _____ **ZIP** _____

☐**AE** ☐**MC** ☐**VISA** ☐**Check Enclosed**

Card# _____ **Exp. Date** _____

Special offer on Foreign Rate!
Canada/Mexico $27 **Foreign Surface $27–1 year (12 issues)**
(US funds)

Please allow 4–6 weeks for processing of first issue. Offer valid for a limited time only. 3836A

☐YES, I could use a little excitement in my hobby!

SPECIAL OFFER!

Send me 12 issues of *73* for the low subscription price of $19.97: save over $15 off the cover price! (Base sub rate: $24.97)

NAME _____ CALL _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

☐AE ☐MC ☐VISA ☐Check Enclosed

Card# _____ Exp. Date _____

Special offer on Foreign Rate!
Canada/Mexico $27 Foreign Surface $27–1 year (12 issues)
(US funds)

Please allow 4–6 weeks for processing of first issue. Offer valid for a limited time only. 3836A

☐YES, I could use a little excitement in my hobby!

SPECIAL OFFER!

Send me 12 issues of *73* for the low subscription price of $19.97: save over $15 off the cover price! (Base sub rate: $24.97)

NAME _____ CALL _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

☐AE ☐MC ☐VISA ☐Check Enclosed

Card# _____ Exp. Date _____

Special offer on Foreign Rate!
Canada/Mexico $27 Foreign Surface $27–1 year (12 issues)
(US funds)

Please allow 4–6 weeks for processing of first issue. Offer valid for a limited time only. 3836A

Austin 2M/ 1¼M/70CM tri-band antenna which requires but a single coaxial line is sweeping the country
$69.95 + $4.50 PH
PA 6% tax

Ed Noll (W3FQJ)
PO Box 75
Chalfont, PA 18914

CIRCLE 305 ON READER SERVICE CARD

The Supertemp XY7 Soldering Station
The Ultimate in Controlled Temperature Hand Soldering

Features:
- "Selectability" in 54° increments between 608°F and 824°F–also C° readings.
- "Zero voltage switching" protecting voltage & current sensing devices.
- "Maintained tip accuracy" to within ±6°F (3°C)

dt
Davie Tech Inc.
Electronic Tools & Accesories
2-05 Banta Place
Fairlawn NJ 07410
(201) 796-1720

CIRCLE 310 ON READER SERVICE CARD

★★★★★ PRESENTING ★★★★★
CABLE TV DESCRAMBLERS
★★★★★ STARRING ★★★★★
JERROLD, HAMLIN, OAK
AND OTHER FAMOUS MANUFACTURERS
- FINEST WARRANTY PROGRAM AVAILABLE
- LOWEST RETAIL/WHOLESALE PRICES IN U.S.
- ORDERS SHIPPED FROM STOCK WITHIN 24 HOURS

FOR FREE CATALOG ONLY 1-800-345-8927
FOR ALL INFORMATION 1-818-716-5914

PACIFIC CABLE CO. INC.
7325½ RESDA BLVD., DEPT 1813
RESDA, CA 91335

CIRCLE 178 ON READER SERVICE CARD

QRV Solar Power for your Station

The $289.95 Bullet-tested QRV Solar Power Supply keeps your repeater on the air 'round the clock or powers your 100-watt HF station 60 hrs a month. Control circuit speeds charge, protects gel cells & sealed batteries. Fully assembled, QRV, expandible, portable.

Add $10 S & H. Info 56c s.a.s.e. *AntennasWest*
1971 N. Oak Ln., Provo, UT 84604 (801) 374-1084

CIRCLE 89 ON READER SERVICE CARD

★ **OMAR ELECTRONICS** ★
FOR ALL YOUR AMATEUR NEEDS
SPECIAL PRICES on all
MFJ PRODUCTS ★ A.R.R.L. PUBLICATIONS
and other Ham Radio equipment!
VISA **404-466-3241** MasterCard
OMAR ELECTRONICS • Omar Pupo WA8FON
RTE 1 HIGHWAY 81 SO. • LOGANVILLE, GA 30249

CIRCLE 292 ON READER SERVICE CARD

QEP's SALE CONTINUES
Due to the increase in copper prices, all coax cable WILL increase. Better buy it NOW.

- **BELDEN 9913 low-loss**
  500 ft Roll $185.00 or 39¢/ft.
- **BELDEN 8214 (foam)**
  500 ft Roll $150.00 or 33¢/ft.
- **BELDEN 8267 RG-213**
  500 ft Roll $185.00 or 39¢/ft.
- **BELDEN 8268 RG-214 silver 1.35/ft.**

AMPHENOL SPECIALS

PL-259 silver (mica filled)	$1.25
UG-21D 'N' male cable end	2.75
UG-21D 'N' (fitted for 9913)	3.50
UG-23D 'N' female cable end	3.95
UG-29A 'N' Barrel (jack-jack)	4.50
UG-57B 'N' Barrel (plug-plug)	5.20
UG-58A 'N' Chassis receptacle	3.50
UG-83U 'N' Plug to UHF adaptor	8.00

Copper-clad 14 ga. (7x22)
7¢ a foot (any length)
Identical to Belden 8000

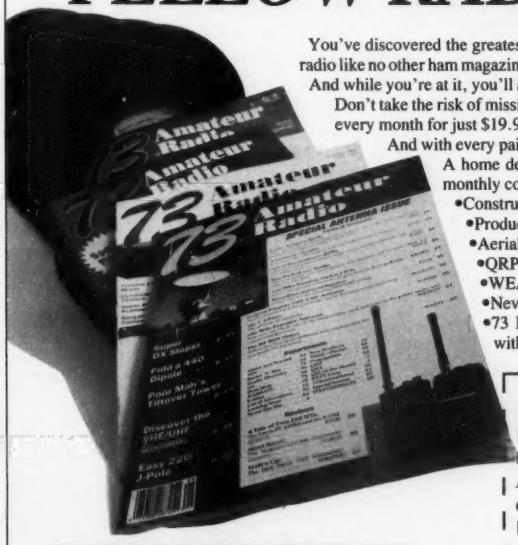
VISA & MASTER CARD ACCEPTED
SHIPPING IS ADDITIONAL
Call TOLL FREE
1-800-USA-9913
in NJ 201-887-6424

110-4 Route 10
East Hanover
N.J. 07936
QEP's

**** SAME DAY SHIPPING ****
TNX JIM N2GKW & BILL KA2QEP

CIRCLE 30 ON READER SERVICE CARD

FELLOW RADIO AMATEURS,



You've discovered the greatest hobby in the world. And *73 Amateur Radio* captures the excitement of amateur radio like no other ham magazine in print today. With *73*, you'll have *fun* discovering the thrills of this great hobby. And while you're at it, you'll also learn more about ham radio.

Don't take the risk of missing out on all *73* has to offer. You can have your issue of *73* delivered to your home every month for just $19.97 (12 issues)—that's 43% off the cover price!

And with every paid subscription we'll send you a FREE GIFT: a great looking *73* baseball cap.

A home delivered copy of *73* means you'll never miss out on these tremendously popular monthly columns:

- Construction projects: The most homebrew projects *anywhere*.
- Product reviews: Belly-to-belly matchups of new gear.
- Aerial View: Everything you'll ever want to know about antennas.
- QRP: For low power aficionados.
- WEATHERSATS: Get the latest fax on the weather.
- Never Say Die: And you bet I won't.
- 73 International: *73 Amateur Radio* is the only ham magazine with monthly news from every corner of the world.

SUBSCRIBE TODAY.

And remember—with every paid subscription order, you'll receive a FREE *73* BASEBALL CAP, and SAVE 43% OFF THE COVER PRICE!

☐ **YES!** I want to receive my copy of *73 Amateur Radio* at home every month. Please start my subscription immediately: 1 year (12 issues) for $19.97 and a FREE *73* BASEBALL CAP!*

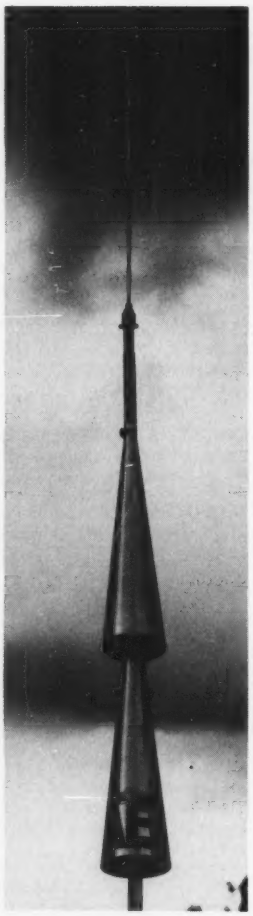
Name _____
Address _____
City _____ State _____ Zip _____
☐ Bill Me ☐ Check Enclosed ☐ Charge my credit card
Account # _____
☐ MC ☐ Visa ☐ Amex Exp. Date _____
Signature _____

Offer valid for a limited time only. Canadian and foreign surface orders: $27 per year (12 issues) U.S. funds. Please allow 4–6 weeks for delivery of first issue. *Free gifts are sent to paid subscribers only.
Mail Coupon to: *73 Amateur Radio*, P.O. Box 931, Farmingdale, NY 11737-9631 7826BC

Put More Punch in Your Packet

Outstanding mechanical design makes the IsoPole the only logical choice for a VHF base station, especially for Packet operation. All Isopole antennas yield the **maximum gain attainable** for their respective lengths and a maximum signal on the horizon. Exceptional decoupling from the feed line results in simple tuning and a significant reduction in TVI potential. The IsoPole antennas are all impedance matched in the factory so that no field tuning is required. The IsoPoles have the broadest frequency coverage of any comparable VHF base station antenna. This means no loss of power output from one end of the band to the other, when used with SWR protected solid state tranceivers. **Typical SWR is 1.4 to 1 or better across the entire band.**

A standard 50 Ohm SO-239 connector is recessed within the base sleeve (fully weather protected). With the IsoPole you will not experience aggravating deviation in SWR with changes in weather. The impedance matching network is weather sealed and designed for maximum legal power. The aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast which is not supplied).



High Performance Hand-Held Antenna — The Hot Rod

The Hot Rod antenna can be expected to make the same improvement to hand-held communications that the IsoPole antennas have made to base station operation. **Achieve 1 or 2 db gain** over ANY 5/8 wave two meter telescopic antenna. The factory tuned HR-1 is 20% shorter, lighter and places far less stress on your hand-held connector and case. It will easily handle over 25 watts of power, making it an excellent emergency base or mobile antenna. In the collapsed position, the Hot Rod antenna will perform like a helical quarter wave. Three Hot Rods are available; HR-1 1/2 wave 2M Ant., HR-2 for 220 Mhz, and HR-4 for 440 Mhz. Amateur Net Price on all Hot Rods is $19.95.

For either base station or hand-held operation AEA has the perfect VHF/UHF antenna. Put more punch in your Packet station with an AEA IsoPole or Hot Rod antenna. To order your new antenna contact your favorite Amateur Radio Distributor. For more information contact Advanced Electronic Applications, P.O. Box C-2160, Lynnwood, WA 98036, or call 206-775-7373.

IsoPole Specifications

Model	144	220	440
Freq. Coverage (Mhz)	135-160	210-230	415-465
2.1 VSWR bandwidth	›12Mhz @ 146Mhz	›15Mhz @ 220Mhz	›22Mhz @ 435Mhz
Power Rating	1 kw	1 kw	1 kw
Gain**	3 dbd	3 dbd	3 dbd
Radiating Element Length	125.5" (3.2m)	79.25" (2m)	46" (1.2m)
Amateur Net Price	$49.95	$49.95	$69.95

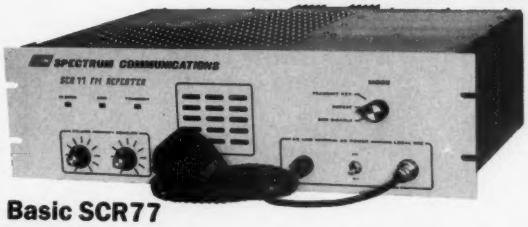
**dbd — db gain over a dipole in free space

Prices and Specifications subject to change without notice or obligation.

AEA Brings you the Breakthrough!

CIRCLE 65 ON READER SERVICE CARD

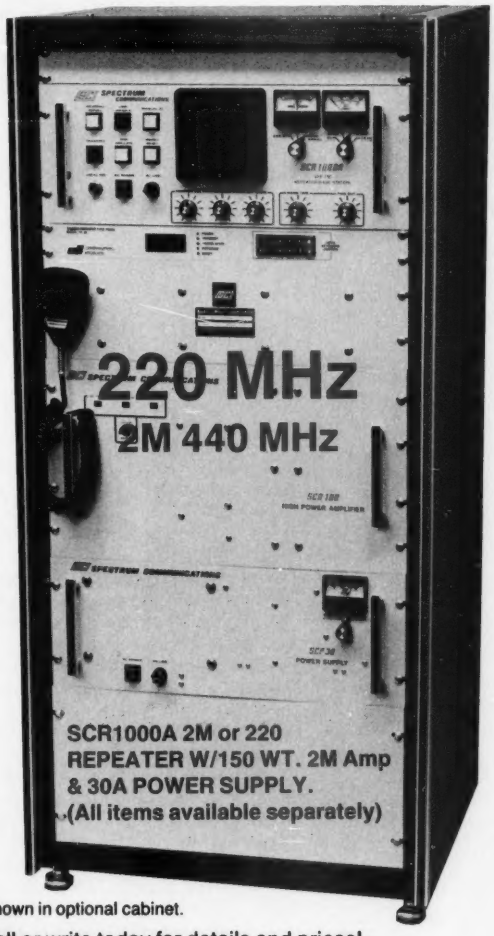
For the Finest in 220 MHz Repeaters, Go with the Leader—



Basic SCR77

SPECTRUM

We've got the greatest design/performance "Know-how"—14 years in the business—with constant improvements in our Repeaters & Link Units!



Shown in optional cabinet.

For that new 220 MHz Machine—Spectrum now makes 3 lines of VHF Repeaters—the world famous Deluxe SCR1000A, the Low Cost line of SCR77s, and the State of the Art Microprocessor Controlled SCR2000X Line of Repeaters!

The SCR77 Repeaters maintain the quality of design, components and construction which have made Spectrum gear famous *throughout* the world for years. However, all of the "bells & whistles" have been eliminated—*at a large cost savings to you!* The SCR77 is a real "workhorse" basic machine designed for those who want excellent, super-reliable performance year after year—*but no frills!*

Of course, if you do want a Full Featured/Super Deluxe Repeater with full panel metering and controls, and a complete list of 'built-in' options, then you want our SCR1000A or the SCR2000X.

All three available with: Autopatch/Reverse Patch/Landline Control; TouchTone Control of various repeater functions; 'PL'; "Emergency Pwr./ID"; Tone & Timer Units; Sharp RX Filters; Power Amps; etc. (2M & 440 MHz Rptrs. and RF Link Units also available.)

Complete Line of VHF/UHF Rcvr. & Xmtr. Boards & Assys. also available. Plus ID, COR, DTMF Control Bds., Antennas, Duplexers, Cabinets, etc. Inquire.

Call or write today for details and prices!
Get your order in A.S.A.P.!
Sold Factory Direct or through Export Sales Reps. only.

SC SPECTRUM COMMUNICATIONS CORP.

1055 W. Germantown Pk, S10 • Norristown, PA 19403 • (215) 631-1710 • TELEX: 846-211

CIRCLE 51 ON READER SERVICE CARD

Number 8 on your Feedback card

Heathkit HF Linear Mods

Cheap and Easy Afternoon Project

by Keith Stieb VE5XZ

The Heathkit SB 200–220 series of linear amplifiers have been around for years now. These linears have proven to be the workhorses of many amateur stations around the world. There have not been very many modifications made to these amplifiers. Obviously, Heathkit designed them right the first time.

The long-term dependability of the high-voltage series diodes comes into question after a review of the linear's schematic. These diodes are used in a full-wave, voltage-doubler circuit. Consultation with the *ARRL Handbook* and several technical manuals led to the following changes to the power supply.

Improving a Good Design

Figure 1 shows the original circuit, and Figure 2 illustrates the recommended modifications.

The basic changes are in the diode strings. The modifications include use of only four diodes on each string instead of six. Further, the new diodes carry ratings of 3 amperes at 1000 PIV. These diodes cost approximately 60 cents apiece. Use of higher voltage diodes and fewer in each leg of the supply would yield a cost far exceeding any gains. Because the diodes are capable of handling 3 amps, they can take any sudden current surges, which may occur during initial power up or rapid T/R switching.

A capacitor and a resistor parallels each diode. The resistor keeps the voltage constant across each diode when reverse-voltage is present. This prevents the first diode from taking the brunt of the initial reverse-voltage. The capacitors are there to absorb surges from the diode switching and anything else that could appear on the line. Voltage spikes could damage the diodes.

The 20Ω, 25W resistor serves a special function. It will limit the initial current surge in the high voltage supply at initial application of power. This is because the filter capacitors have no charge at the time and act like a short circuit until they do charge. This could precipitate damage to the rectifier diodes, or worse yet, the transformer winding! Commercial applications would switch this resistor out of the circuit after a few seconds by a time-delay relay. In this application switching is unnecessary.

The results of the power supply modification have been excellent. In the modified SB-200, the high voltage line increased about 300 volts, and power output increased by about 50 Watts.

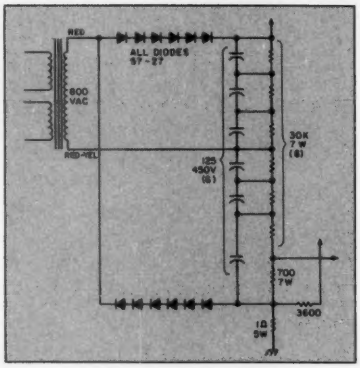


Figure 1. The original circuit.

The Nitty Gritty

Users may exercise their own options to mount the parts required to complete the modification. One method is to solder the capacitors across the body of the diodes and to place the resistors to the foil side of the PC board. The 20Ω resistor can be mounted on this side as well. Some people may choose to mount the resistor on terminal strips located beside the PC board. Others may cut the PC board trace in appropriate locations and directly solder the resistor on the bottom of the board. This will depend on the size of the resistor.

This modification should be done on the SB-220 linear as well. Another diode in the series-string will keep a safety margin. If the manufacturer rates the diodes at 1000 PIV, for instance, a 750 PIV design rating builds in a 25% safety factor.

This modification doesn't take a great deal of time and can be classed as an easy weekender project for a stormy winter!

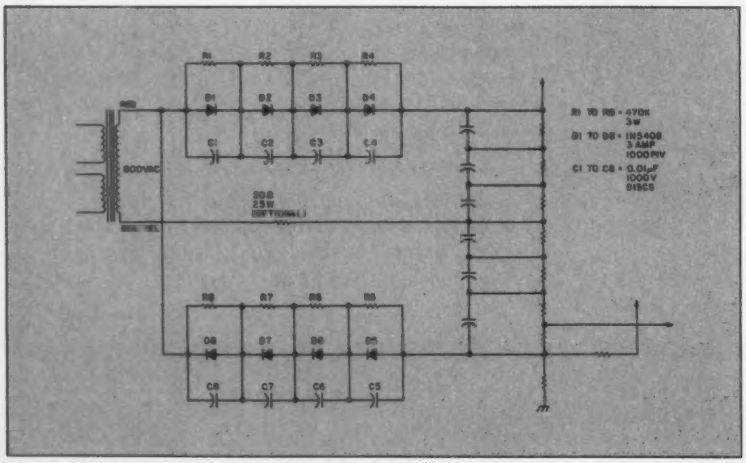


Figure 2. The modified circuit. The basic changes are in the diode strings.

Keith VE5XZ has been a firefighter for seven years for the city of Prince Albert, Canada, as well as an emergency rescue instructor for St John's Ambulance. He's been a ham for 17 years.

uniden®
CB Radios & Scanners

Communications Electronics,™ the world's largest distributor of radio scanners, introduces new models of CB, radar detectors and scanners.

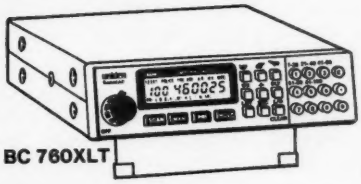
NEW! Bearcat‡ 760XLT-SA

List price $499.95/**CE price $294.95**

12-Band, 100 Channel • Crystalless • AC/DC

Frequency range: 29-54,118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.

The *Bearcat* 760XLT has 100 programmable channels organized as five channel banks for easy use, and 12 bands of coverage including the 800 MHz. band. You also get automatic scanning of preprogrammed aircraft, police, marine, and emergency services. It also includes Weather Search, Priority, Squelch, Lockout and Delay. It has automatic and manual band search to find new active frequencies in other areas of the radio spectrum. The *Bearcat* 760XLT mounts neatly under the dash and connects directly to fuse block or battery. The unit also has an AC adaptor, flip down stand and telescopic antenna for desk top use. 6-5/16" W x 1⅝" H x 7⅜" D. Model **BC 580XLT-SA** is a similar version without the 800 MHz. band for only $219.95.



BC 760XLT

Regency‡ TS2-SA

List price $499.95/**CE price $309.95/SPECIAL**

12-Band, 75 Channel • Crystalless • AC/DC

Frequency range: 29-54,118-175, 406-512, 806-950 MHz.

The *Regency* TS2 scanner lets you monitor Military, Space Satellites, Government, Railroad, Justice Department, State Department, Fish & Game, Immigration, Marine, Police and Fire Departments, Aeronautical AM band, Paramedics, Amateur Radio, plus thousands of other radio frequencies most scanners can't pick up. The *Regency* TS2 features new 40 channel per second *Turbo Scan*™ so you wont miss any of the action. Model **TS1-RA** is a 35 channel version of this radio without the 800 MHz. band and costs only $239.95.

Regency® RH256B-SA

List price $799.95/**CE price $329.95/SPECIAL**

16 Channel • 25 Watt Transceiver • Priority

The *Regency* RH256B is a sixteen-channel VHF land mobile transceiver designed to cover any frequency between 150 to 162 MHz. Since this radio is synthesized, no expensive crystals are needed to store up to 16 frequencies without battery backup. All radios come with CTCSS tone and scanning capabilities. A monitor and night/day switch is also standard. This transceiver even has a priority function. The RH256 makes an ideal radio for any police or fire department volunteer because of its low cost and high performance. A *60 Watt* VHF 150-162 MHz. version called the **RH606B-SA** is available for $429.95. A UHF 15 watt, 10 channel version of this radio called the **RU150B-SA** is also available and covers 450-482 MHz. but the cost is $419.95

SALE Bearcat® 100XL-SA

List price $349.95/**CE price $159.95/CLOSEOUT**

9-Band, 16 Channel • Priority • Scan Delay Search • Limit • Hold • Lockout • AC/DC

Frequency range: 30-50, 118-174, 406-512 MHz.

Uniden has authorized CEI to closeout the famous *Bearcat* 100XL to make room for new models. This scanner has a full 16 channels with frequency coverage that includes all public service bands. Wow... what a scanner! Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. Since this is a special closeout price on our last 200 pieces, you must order your *Bearcat* today to take advantage of this excellent scanner opportunity.

★★★ Uniden CB Radios ★★★

The *Uniden* line of Citizens Band Radio transceivers is styled to compliment other mobile audio equipment. Uniden CB radios are so reliable that they have a two year limited warranty. From the feature packed PRO 540e to the 310e handheld, there is no better Citizens Band radio of the market today.

PRO310E-SA *Uniden* 40 Ch. Portable/Mobile CB . . . $85.95
PRO330E-SA *Uniden* 40 Ch. Remote mount CB . . . $109.95
NINJA-SA PRO310E with rechargeable battery pack.$99.95
B-10-SA 1.2V AA Ni-cad batt. for Ninja (set of 10) $20.95
KARATE-SA *Uniden* 40 channel rescue radio $69.95
PRO520E-SA *Uniden* 40 channel CB Mobile $59.95
PRO540E-SA *Uniden* 40 channel CB Mobile . . . $119.95
PRO640E-SA *Uniden* 40 channel SSB CB mobile . . . $159.95
PRO710E-SA *Uniden* 40 channel CB Base $119.95
PRO810E-SA *Uniden*40 channel SSB CB Base $179.95

★★★ Uniden Radar Detectors ★★★

Buy the finest *Uniden* radar detectors from CEI today.
RD7-SA *Uniden* visor mount radar detector $109.95
RD9-SA *Uniden* "Passport" size radar detector . . . $129.95
RD9XL-SA *Uniden* "micro" size radar detector . . . $159.95
RD25-SA *Uniden* visor mount radar detector $59.95
RD500-SA Uniden visor mount radar detector $79.95

NEW! Bearcat® 200XLT-SA

New Product...Available May, 1988

List price $509.95/**CE price $299.95**

12-Band, 200 Channel • 800 MHz. Handheld Search • Limit • Hold • Priority • Lockout

Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.

The *Bearcat* 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 20 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the **BC 100XLT-SA** for only $219.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

Bearcat® 800XLT-SA

List price $499.95/**CE price $259.95/SPECIAL**

12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC

Bands: 29-54, 118-174, 406-512, 806-912 MHz.

The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-SA** is available for $196.95.

Bearcat® 145XL-SA

List price $189.95/**CE price $98.95/SPECIAL**

10-Band, 16 Channel • No-crystal scanner Priority control • Weather search • AC/DC

Bands: 29-54, 136-174, 406-512 MHz.

The *Bearcat* 145XL is a 16 channel, programmable scanner covering ten frequency bands. The unit features a built-in delay function that adds a three second delay on all channels to prevent missed transmissions.

Bearcat® 175XL-SA

List price $279.95/**CE price $156.95/SPECIAL**

11-Band, 16 Channel • Weather Search Priority control • Search/Scan • AC/DC

Bands: 29-54, 118-174, 406-512 MHz.

The *Bearcat* 175XL has an automatic search feature to locate new frequencies. Priority, lock out, delay and scan speed are all included.

Regency® Informant™ Scanners

Frequency coverage: 35-54, 136-174 406-512 MHz.

The new *Regency* Informant scanners cover virtually all the standard police, fire, emergency and weather frequencies. These special scanners are preprogrammed by state in the units memory. Just pick a state and a category. The Informant does the rest. All Informant radios have a feature called *Turbo Scan*™ to scan up to 40 channels per second. The **INF1-SA** is ideal for truckers and is only $199.95. The new **INF2-SA** is a deluxe model and has ham radio, a weather alert and other exciting features built in for only $239.95. For base station use, the **INF5-SA** is only $149.95 and for those who can afford the best, the **INF3-SA** at $209.95, is a state-of-the-art, receiver that spells out what service you're listining to such as Military, Airphone, Paging, State Police, Coast Guard or Press.

Regency® HX1500-SA

List price $369.95/**CE price $179.95/SPECIAL**

11-Band, 55 Channel • Handheld/Portable Search • Lockout • Priority • Bank Select Sidelit liquid crystal display • EAROM Memory Direct Channel Access Feature • Scan delay

Bands: 29-54, 118-136, 144-174, 406-420, 440-512 MHz.

The new handheld *Regency* HX1500 scanner is fully keyboard programmable for the ultimate in versatility. You can scan up to 55 channels at the same time including the AM aircraft band. The LCD display is even sidelit for night use. Includes belt clip, flexible antenna and earphone. Operates on 8 1.2 Volt rechargeable Ni-cad batteries (not included). Be sure to order batteries and battery charger from the accessory list in this ad.

★★★ Uniden Cordless Phones ★★★

A major consumer magazine did a comparison study on cordless phones. The check points included clarity, efficiency and price. *Uniden* was rated best buy.

XE300-SA *Uniden* Cordless Phone $69.95
XE500-SA *Uniden* Cordless Phone with paging. . . . $84.95
XE700-SA *Uniden* Cordless Phone with speaker . . . $114.95

★★★ Extended Warranty Program ★★★

If you purchase a scanner, CB, radar detector or cordless phone from any store in the U.S. or Canada within the last 30 days, you can get up to three years of extended warranty service from Warrantech. This service extension plan begins *after* the manufacturer's warranty expires. Warrantech will perform all necessary labor and will not charge for return shipping. Extended warranties are non-refundable and apply only to the original purchaser. A two year extended warranty on a mobile or base scanner is $29.99 and three years is $39.99. For handheld scanners, 2 years is $59.95 and 3 years is $79.95. For radar detectors, two years is $29.95. For CB radios, 2 years is $39.99. For cordless phones, 3 years is $34.99. Order your warranty for your merchandise today.

OTHER RADIOS AND ACCESSORIES

***NEW!* BC 55XL-SA** *Bearcat* 10 channel scanner . . . $114.95
BC 70XLT-SA *Bearcat* 20 channel scanner $169.95
R1090-SA *Regency* 45 ch. scanner . . . **CLOSEOUT** $119.95
Z80-SA *Regency* 60 ch. scanner . . . **CLOSEOUT** $129.95
UC102-SA *Regency* VHF 2 ch. 1 Watt transceiver . . . $117.95
BPS5-SA *Regency* 16 amp reg. power supply $169.95
MA549-SA Drop-in charger for HX1200 & HX1500 . . . $84.95
MA518-SA Wall charger for HX1500 scanner $14.95
MA553-SA Carrying case for HX1500 scanner $19.95
MA257-SA Cigarette lighter cord for HX12/1500 . . . $19.95
MA917-SA Ni-Cad battery pack for HX1000/1200 . . . $34.95
BP205 Ni-Cad battery pack for BC200/BC100XLT. . . $49.95
B-8-SA 1.2 V AA Ni-Cad batteries (set of eight) $17.95
FB-E-SA Frequency Directory for Eastern U.S.A. . . . $14.95
FB-W-SA Frequency Directory for Western U.S.A. . . . $14.95
ASD-SA Air Scan Directory $14.95
SRF-SA Survival Radio Frequency Directory. $14.95
TSG-SA "Top Secret" Registry of U.S. Govt. Freq. . . . $14.95
TIC-SA Techniques for Intercepting Comm. $14.95
RRF-SA Railroad frequency directory. $14.95
EEC-SA Embassy & Espionage Communications . . . $14.95
CIE-SA Covert Intelligenct, Elect. Eavesdropping . . . $14.95
MFF-SA Midwest Federal Frequency directory $14.95
A60-SA Magnet mount mobile scanner antenna. . . $35.95
A70-SA Base station scanner antenna. $35.95
USAMM-SA Mag mount VHF ant. w/ 12' cable. $39.95
USAK-SA ¾" hole mount VHF ant. w/ 17' cable. . . . $35.95
USAK450-SA ¾" hole mount UHF ant. w/ 17' cable. . . $35.95

Add $3.00 shipping for all *accessories* ordered at the same time. Add $7.00 shipping per radio and $3.00 per antenna.

BUY WITH CONFIDENCE

To ***get the fastest delivery from CE*** of any scanner, send or phone your order directly to our Scanner Distribution Center.™ Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. All sales on accessories are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically unless CE is instructed differently. A $5.00 additional handling fee will be charged for all orders with a merchandise total under $50.00. Shipments are F.O.B. Ann Arbor, Michigan. No COD's. Most products that we sell have a manufacturer's warranty. Free copies of warranties on these products are available prior to purchase by writing to CE. Non-certified checks require bank clearance. Not responsible for typographical errors.

Mail orders to: Communications Electronics,™ Box 1045, Ann Arbor, Michigan 48106 U.S.A. Add $7.00 per scanner for R.P.S./U.P.S. *ground* shipping and handling in the continental U.S.A. For Canada, Puerto Rico, Hawaii, Alaska, or APO/FPO delivery, shipping charges are three times continental U.S. rates. If you have a Discover, Visa or Master Card, you may call and place a credit card order. Order toll-free in the U.S. Dial 800-USA-SCAN. In Canada, order toll-free by calling 800-221-3475. FAX anytime, dial 313-971-6000. If you are outside the U.S. or in Michigan dial 313-973-8888. Order today.

Scanner Distribution Center™ and CEI logos are trademarks of Communications Electronics Inc.

‡ *Bearcat* is a registered trademark of Uniden Corporation.
† *Regency* and *Turbo Scan* are registered trademarks of Regency Electronics Inc. AD #020288-SA

Copyright © 1988 Communications Electronics Inc.

For credit card orders call 1-800-USA-SCAN

COMMUNICATIONS ELECTRONICS INC.™

Consumer Products Division

P.O. Box 1045 □ Ann Arbor, Michigan 48106-1045 U.S.A.
For orders call 313-973-8888 or FAX 313-971-6000

CIRCLE 121 ON READER SERVICE CARD

Number 8 on your Feedback Card

10 Meter Meteor Scatter

No Sunspots Required!

by Larry Jones WB5KYK

Ten meters was alive and well with signals on August 12, 1987. The band even included the signals propagated by meteor scatter. The Perseids meteor shower took the Novices by surprise. QSOs were incomplete—most stations didn't know "ping mode" operation. Many stations later reported that this type of propagation was completely new to them. Yet, meteor scatter can be a useful tool to all operators interested in increasing DX on this band. Meteor scatter can make new states accessible.

Meteor showers occur at regular intervals each year. Nature keeps a very reliable clock. An almanac from any newsstand lists their dates as well as the *ARRL Handbook*. The 1987 handbook lists the following four major showers: Quadrantids (January 3), Arietids (June 7–8), Perseids (August 12–13), and Geminids (December 12–13). Both major and minor showers can help the experienced operator make long-haul contacts. Summer showers work best on a North-South path and the Winter showers work best on an East-West path at my QTH. Just experiment and see which showers and directions work out.

What It Takes

What kind of station does it take to operate meteor scatter (MS)? The best affordable receiver and, if possible, a preamp. It can mean the difference between a completed contact or a near miss. MFJ and Palomar make RF switching units that work well for 10-meter meteor scatter and can handle up to about 350 watts. A speaker with audio filtering is an asset along with a good, comfortable set of headphones. Enter the world of weak signal work.

A meteor leaves a trail of ionized gas as it travels through the ionosphere. This ionized trail reflects radio signals but is usable for a very brief time. The better the receiver, the longer the useful period of ionization. When this column of ionization is lost, there is a wait until another meteor enters the atmosphere.

The transmitter should operate CW or SSB with at least 100 watts output. CW is the most effective mode for scatter work because of the weak signals involved. Numerous Novices exercising their 10m phone privileges are audible via 10 meter meteor scatter.

Table 12. Calendar of the main meteor showers

Start	Dates of Maximum	End	Name	Comparative rate*	Transit Time	Elev
Jan 01	Jan 03	Jan 06	Quadrantids	6	09	90
Apr 19	Apr 21	Apr 24	April Lyrids	3	04	70
May 01	May 05	May 08	Eta Aquarids	3	08	40
Jun 10	Jun 16	Jun 21	June Lyrids	2	01	70
Jun 17	Jun 20	Jun 26	Ophiuchids	2	23	20
Jul 10	Jul 26	Aug 15	Capricornids	2	01	20
Jul 15	Jul 27	Aug 15	Delta Aquarids	4	02	30
Jul 15	Jul 31	Aug 20	Pisces Australids	2	02	10
Jul 15	Jul 30	Aug 25	Alpha Capricornids	2	00	30
Jul 15	Aug 06	Aug 25	Iota Aquarids	2	01	30
Jul 25	Aug 12	Aug 18	Perseids	5	06	80†
Aug 19	Aug 21	Aug 22	Chi Cygnids	1	21	90
Oct 16	Oct 21	Oct 26	Orionids	4	04	50
Oct 20	Nov 08	Nov 30	Taurids	3	01	60
Nov 07	Nov 09	Nov 11	Cepheids	2	20	80†
Nov 15	Nov 17	Nov 19	Leonids	2	06	60
Dec 07	Dec 14	Dec 15	Geminids	5	02	70
Dec 17	Dec 22	Dec 24	Ursids	1	08	60†

*Each step on the comparative rate scale represents a factor of 2.
†Above northern horizon.

Table 1. Major meteor showers occur with predictable regularity. Their dates can be found in the ARRL Handbook *and almanacs.*

1988 CALLBOOKS

The "Flying Horse" sets the standards

Continuing a 67 year tradition, we bring you three new Callbooks for 1988.

The North American Callbook lists the calls, names, and address information for 478,000 licensed radio amateurs in all countries of North America, from Canada to Panama including Greenland, Bermuda, and the Caribbean islands plus Hawaii and the U.S. possessions.

The International Callbook lists 481,000 licensed radio amateurs in countries outside North America. Its coverage includes South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions).

The 1988 Callbook Supplement is a new idea in Callbook updates, listing the activity in both the North American and International Callbooks. Published June 1, 1988, this Supplement will include thousands of new licenses, address changes, and call sign changes for the preceding 6 months.

The 1988 Callbooks will be published December 1, 1987. See your dealer or order now directly from the publisher.

☐ North American Callbook	
incl. shipping within USA	$28.00
incl. shipping to foreign countries	30.00
☐ International Callbook	
incl. shipping within USA	$30.00
incl. shipping to foreign countries	32.00
☐ Callbook Supplement, published June 1st	
incl. shipping within USA	$13.00
incl. shipping to foreign countries	14.00

SPECIAL OFFER

☐ Both N.A. & International Callbooks	
incl. shipping within USA	$55.00
incl. shipping to foreign countries	60.00

* * * * * * * * * * * * *

Illinois residents please add 6½% tax.
All payments must be in U.S. funds.

RADIO AMATEUR **callbook** INC.
Dept. B
925 Sherwood Dr., Box 247
Lake Bluff, IL 60044, USA

Tel: (312) 234-6600 VISA MasterCard

CIRCLE 31 ON READER SERVICE CARD

BETTER FILTERS—BETTER PRICES!

Big ads are costly. Small ones don't tell the whole story but help us reduce prices of our top-rated FOX TANGO 8-pole filters for Kenwood, Yaesu, Drake, Heath, and Collins. Get full info by sending an SASE for our complete Price List and Information Sheets. Save 10% or more on all our filters. Or order from our drop-in Super-Specials below. Discounts apply only to present limited stock. Check availability/order by phone. No COD's—VISA/MC orders get priority. Shipping: US $5, Canada $6, Other $13.

BRAND	MODEL	MODE	BANDWIDTHS	IF	PRICE	OFF
YAESU	FT-102	CW	(250, 400Hz)	.455MHz	$75	20%
	FT-101	SSB	(2.1 & 2.4kHz)	3.18	$80	20%
	FT-101ZD/107/901-2, 1.8k			8.9875	$80	30%
	FT-980/726	CW	(500Hz)	.455	$75	25%
	FT-200 (Tempo I)		CW (500Hz)	9M	$80	25%
	FT-301/7	(250Hz,2.1,2.4kHz)		9M	$80	25%
	FT-580-401	SSB	(1.8/2.4kHz)	3.18	$70	33%
ICOM	IC-740/745/750	CW	(500Hz)	.455	$85	20%
KENWOOD	TS520	(250Hz/1.8/2.1kHz)		3.395	$80	30%
	TS830(only)	CW	(400Hz)	.4557	$110	30%
DRAKE	R-4C	SSB	(1.8 and 2.1kHz)	5.695	$85	25%
HEATH	SB-104A	CW	(400Hz)	3.3957kHz	$85	40%
	All models SSB (1.8 & 2.1)			3.395	$85	25%

Improve your selectivity by filter cascading, or by replacing your present aging filter with one of narrower bandwidth. Like the ARRL, use the 9mHz FT-301's for home-brew projects. Use the bargain SB-104A CW for any Heath rig by changing one crystal; instructions supplied.

14-year Fox Tango Newsletter Index—Reg. $5, Now FREE
(with purchase of any filter for a Yaesu rig)

FOX TANGO CORPORATION
Box 15944, W. Palm Beach, FL 33416
Telephone: (305) 683-9587

CIRCLE 58 ON READER SERVICE CARD

HAM RADIO SELF STUDY COURSE

NOW ONLY $19.95 Plus $2.00 shipping & handling

VISA/MasterCard Accepted

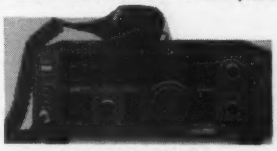
Prepare for the fantastic world of amateur radio. Study at your leisure. No technical background required. Entry level amateur radio operators can now talk on the ten meter band and FM repeaters. . .even link their ham radio stations to the public telephone system and personal computers. Privileges never before available to the beginner! Complete FCC license preparation course contains everything you need to know to pass both the written and Morse code examination in a very short time. Written in easy-to-understand language. Contains fully illustrated text book, two long-play code learning cassettes, all 302 word-for-word FCC license test questions, answers. . .and much more! You can't miss! Sold with a 10 day money back guarantee. Phone orders accepted. Dealer and classroom instructor discounts available.

W5YI-VEC P.O. BOX #10101
Dallas, Texas 75207 - Tel: 817-461-6443

MADISON SHOPPER

CALL FOR ORDERS
1 (800) 231-3057
1-713-520-7300 OR 1-713-520-0550
TEXAS ORDERS CALL COLLECT
ALL ITEMS ARE GUARANTEED OR SALES PRICE REFUNDED

Icom IC New ..... Trades wanted
Kenwood TH215A, TH25AT ..... Trade in your old HT



Kenwood TS140S — Call

Kenwood TS 140S ..... Call for trade
New Kenwood TM-221A, 45W, mobile ..... Call
ICOM 28H/TTM ..... Call

Icom 761 ..... Call

Shure 444D 54.95
Astatic MC321 Cartridge D104 ..... 12.00
Astatic D104C/TUP-9 ..... 72.00

Isopole 144 MHz 44.95
Cushcraft 124-WB (146 MHz) 33.00
Butternut HF6V, 80-10 vertical 125.00
Hustler G7-144 ..... 119.95
KLM HF World Class Series Antennas ..... Call Don
KLM KT-34A 399.00
NEW KLM 1,2-44LBX 129.00
G5-RV 44.00

Avanti AP151.3G on Glass Antenna 36.00
Anteco 2M, 5/8, Mag. Mount, Comp 25.00

Thousands of panel meters ..... 3.95 up CALL
8560A 95.00
Aerovox 1000 pf/500 V feedthrough caps 1.95
Transformer 120 V Pri., 1050 V/1A. (Sec. #18 Wire) 50.00
100 mfd/450V Axial Cap 2.00

831SP-PL259 Silverplate 1.25
82-61 N Male 3.00

GE 6146B 13.95
3-500Z 140.00
GE 12BY7A 7.00
6MJ6 ..... 12.95
6KD6 ..... 12.95

AEA PK-232 with new WX FAX 299.00
Kantronics KPC II 149.00
AEA Packet Terminal ..... Call

USED EQUIPMENT
All equipment, used, clean, with 90 day warranty and 30 day trial. Six months full trade against new equipment. Sale price refunded if not satisfied.
Call for latest used gear
(800) 231-3057
TS-430S, TS-830S, TS-520S, FT101E, and Collins

Porcelain 502 Guy Insulators (1/4) 3.39

POLICIES
Minimum order $10.00. Mastercard, VISA, or C.O.D. All prices FOB Houston, except as noted. Prices subject to change without notice. Items subject to prior sale. Call anytime to check the status of your order. Texas residents add sales tax. All items full factory warranty plus Madison warranty.

Bird and Belden products in stock. Call today.

MADISON
Electronics Supply
3621 FANNIN
HOUSTON, TEXAS 77004
MasterCard VISA

CIRCLE 25 ON READER SERVICE CARD

Packet can be used on meteor scatter. Some operators use 2m packet successfully, and this mode has potential for 10m, too.

Most QSOs made via meteor scatter are with skeds. The blind calling that occurred on 10 meters during the Perseids is a good example of the need for skeds in meteor shower activity.

Antennas

The subject of antennas and meteor scatter is controversial. Some operators prefer to use a non-directional antenna for receive and a high gain antenna for transmit. The advantage of using the same antenna for transmit and receive is simple. Working skeds via meteor scatter, operators must know relative directions of the other stations. One antenna insures listening in the exact direction of transmission.

The high gain monoband beams that are on the market today are good for meteor scatter. Cushcraft, Create, KLM, and Hy-Gain market monoband beams for 10 meters. The higher the gain the better. Beam antennas must get a minimum of 10 dB gain over a dipole antenna to be successful with meteor scatter. Quads are not satisfactory on meteor scatter, but big wire antennas work well. I use a 5.25 wavelength inverted L that operates against 17,032 feet of buried radials.

The antenna should be in a clearing, or at least above any nearby obstructions. A tilt angle of 11 degrees works well on meteor showers from this location with a beam. However, when using a beam a slight tilt upward will help, regardless of the exact angle. It is possible to work stations on 10 meters (and 2 meters) with antennas at the 30' level. Use the best feed line available like Belden 9913. Low loss and high gain will make a meteor scatter antenna system successful.

Verticals with a good radial system will work on 10m meteor scatter, too. Here, the gain of a beam is replaced with the efficiency of a vertical operated against a big radial system. It takes a lot of work to put down a good radial system, and the vertical *must* be in the clear. Using a vertical with less than 60 radials was largely unsuccessful.

A heavy duty power supply is essential because transmitting for long periods is the norm on some skeds. It is also helpful to have a programmable keyer for CW contacts.

Scheduling Contacts

Most meteor scatter operators make schedules by checking the contest results (10 meter) and writing these active 10 meter operators to ask for a sked. Some stations use on-the-air contacts to arrange skeds. Others use stations listed in 10-10 International's newsletter to obtain the calls of active 10 meter operators who might be interested in a sked. The 10m meteor scatter gang is loosely organized and does not yet have a list of stations interested in this form of propagation.

Once the date, time, and frequency have been established, the operators must establish a transmitting and listening rota. Experienced meteor scatter operators transmit in 15 second intervals. By established convention, the station farthest west should transmit the first 15 seconds of the minute, listen the second, transmit the third period and listen the fourth period. Operating discipline and attention to detail are *essential* for a successful contact.

Also establish a time frame to keep the sked going—generally for a maximum of 30 minutes if contact is unsuccessful. Have an accurate clock in your shack set exactly with WWV, because timing is critical in meteor scatter work.

"Contacts are valid only when both calls and reports have been sent and received."

Active 2m meteor scatter operators are good sources of information on the best scheduling times and related activities. Accurate activity logs are essential for meteor scatter predictions. Always keep track of attempted schedules, transmission times and directions, and any stations heard but not necessarily worked. These activity logs will ultimately serve as the basis for reliable scatter propagation predictions, and more successful contacts will follow.

Naturally, most meteor scatter opportunities occur at the peaks of respective meteor showers. The date of a shower's peak can be found in the references listed previously. Try to arrange a sked or two prior to the peak dates. Meteor debris preceding the main body of the shower will frequently cause enough ionization to allow successful contacts. It takes a long time to complete this type of contact, since the periods of ionization are short (1-3 seconds), and many minutes can pass before another period occurs.

Speak quickly during SSB contacts, or send as quickly as possible with CW. Fifteen seconds is not a lot of time to convey information. Then *listen*. Listening is paramount in weak signal work.

Signal Reporting

During the actual contact, signal reports may be given in one of two ways. The first is to report as usual with information to the station about his signal strength or, if on CW, about the RST. The second way is to tell the other station how long the meteor burst lasts. (S3 = 3 seconds, etc.). The two stations operating the sked should agree upon their reporting system—most 10m operators use signal strength reports because bursts on ten meters last longer than on the VHF bands.

Sample sked: NY station—agreed on signal strength reports; sked run on 28.392 at 1230Z UTC on October 21; operator farthest west transmits first on USB; sked will end at 1300Z UTC unless signals are being copied (if so, until 1330Z).

Sample first 15 seconds: "W2...this is WB5KYK (repeat as often as possible in 15 seconds). Over." Listen during the next 15 second period, and the W2 will transmit the same. If I copied the W2, then during the third 15 second segment I will send, "This is WB5KYK, S7, S7, S7 (repeat his report for 15 seconds). Over." If the W2 has copied, he will send my report as I sent his for a 15 second interval. If he had not copied my report, he would call me rather than send a report. Don't waste the burst time by sending unnecessary information.

In the first or third time frame never send a report until calls are copied. In the second or fourth time frame, never send a report as copied. Now, if I have copied his report, I acknowledge *that* report by sending "This is WB5KYK, Roger, Roger, Roger," for 15 seconds. Contacts are valid only when both calls and reports have been sent and received.

Always QSL as soon as possible after a meteor scatter QSO. Meteor scatter operators have established a certain protocol for QSL exchanges, which depends on who requested the schedule. The station requesting the sked should be *sure* to enclose an SASE with the QSL card. Always let the station that requested the sked QSL first, and respond to his QSL in a timely manner.

"Listening is paramount in weak signal work."

A Wrap-up

Meteor scatter is not the place to discuss antennas, rigs, or chat. A QSO can be as short as a few seconds. Meteor scatter is for sharp operators and those who want to acquire operating skill. The QSOs will appear difficult at first, but the experienced operators are eager to share their knowledge with those who want to learn. They like to spin tales about that long-ago shower. Patience is essential—few QSOs go as smoothly as the example.

If you need help, drop me a line and an SASE. May all your bursts be long. 73

Larry Jones WB5KYK is an enthusiastic MS operator who wants to encourage others to enhance this skill. He can be reached at Route 12, Box 139C, Laurel MS 39440.

THE MOST AFFORDABLE REPEATER

ALSO HAS THE MOST IMPRESSIVE PERFORMANCE FEATURES

(AND GIVES THEM TO YOU AS STANDARD EQUIPMENT!)

KIT, ONLY $675

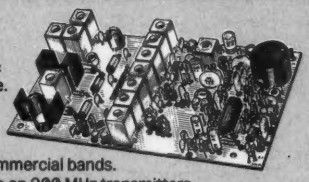
WIRED $975

VHF OR UHF

FEATURES:

- **SENSITIVITY SECOND TO NONE! GaAsFET front end** on vhf models gives 12dB SINAD of 0.12uV (vhf), 0.15uV (220). UHF model 0.25uV std, 0.1uV with optional helical resonator preamp.
- **SELECTIVITY THAT CAN'T BE BEAT!** Both 8-pole xtal filter & ceramic filter for **>100dB at only ±12kHz.** Helical resonator front end to combat desense & intermod.
- **CLEAN, STABLE TRANSMITTER,** up to 18W output standard; 50W with accessory power amplifier.
- **FCC TYPE ACCEPTED** for commercial high band and uhf.
- **Courtesy beep,** field-programmable CWID, flutter-proof squelch, automatic frequency control to compensate for off-frequency transmitters (all standard features).
- **Full range of options** available, such as autopatch, phone line or radio remote control, sub-audible tones, duplexers.

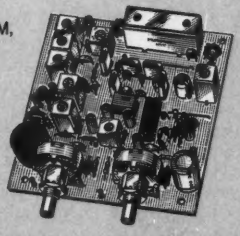
HIGH PERFORMANCE TRANSMITTERS & RECEIVERS FOR REPEATERS AUDIO & DIGITAL LINKS, TELEMETRY, ETC.



- **FM EXCITERS:** Kits $99, W/t $179. 2W contin.ous duty. TCXO & xtal oven options available.
- **TA51 for 10M, 6M, 2M, 150-174, 220 MHz.**
- **TA451 for uhf.**

FCC type accepted for commercial bands.

- Call for latest information on 900 MHz transmitters.
- **VHF & UHF AMPLIFIERS.** For FM, SSB, ATV. Output from 10 to 50 Watts. Several models, kits starting at $79.



- **R144/R220 FM RECEIVERS** for 2M, 150-174, or 220 MHz. **GaAs FET** front end, 0.12uV sensitivity! Both crystal & ceramic filters plus helical resonator front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere)! Flutter-proof squelch. AFC tracks drifting transmitters. Kit $149, w/t $229.
- **R451 UHF FM RCVR.** Similar to above. Tuned line front end, 0.25uV sens. (0.1uV with optional hel. res. preamp). Kit $149, w/t $229.
- **R901 FM RCVR FOR 900 MHZ.** Triple-conversion, GaAs FET front end, 0.2uV sens. Kit $169, w/t $259.
- **R76 ECONOMY VHF FM RCVR** for 10M, 6M, 2M, 220. Without hel res or afc. Kits only $129.
- **Weather satellite & AM Aircraft receivers also avail.**

FCC TYPE-ACCEPTED TRANSMITTERS & RECEIVERS AVAILABLE FOR HIGH-BAND AND UHF. CALL FOR DETAILS.

GaAs FET PREAMPS

at a fraction of the cost of comparable units!

LNG -(*)

GaAs FET PREAMP

ONLY $59! Wired/tested

FEATURES:

- **Very Low Noise:** 0.7dB VHF, 0.8dB UHF
- **High Gain:** 13-20dB, depending on frequency
- **Wide Dynamic Range:** to resist overload
- **Stable:** new-type dual-gate GaAs FET

** Specify tuning range desired: 26-30, 46-56, 137-150, 150-172, 210-230, 400-470, or 800-960 MHz.*

LNW -(*)

MINIATURE GaAs FET PREAMP

ONLY $24/kit, $39 Wired/tested

GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

** Specify tuning range desired: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, or 400-500 MHz.*

LNS-(*)

IN-LINE PREAMP

ONLY $79/kit, $99 Wired/tested

GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W.

**Specify tuning range desired: 120-175, 200-240, or 400-500 MHz.*

HELICAL RESONATOR PREAMPS

Low-noise preamps with helical resonators **reduce intermod & cross-band** interference in critical applications.

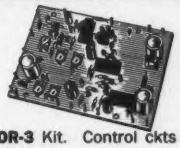
MODEL HRA-(*), $49 vhf, $84 uhf.

** Specify tuning range desired: 143-150, 150-158, 158-162, 162-174, 213-233, 420-450, 450-465, or 465-475 MHz.*

NEW HIGH-SPEED DIGITAL RF LINKS

You've waited a long time for a simple, reliable, **low-cost 9600 baud PACKET NETWORKING system.** Now you've got it! Our new MO-96 MODEM and direct FSK Transmitters and Receivers for 220 or 440 MHz interface directly with most TNC's. Fast diode switched PA's output 15 or 50W. **Call for complete info on the right system for your application.**

ACCESSORIES



- **COR-3** Kit. Control ckts and audio mixers needed to make a repeater. Tail & time-out timers, local spkr ampl, courtesy beep $49
- **CWID** Kit. Field programmable, timers, the works $59
- **TD-2 DTMF DECODER/CONTROLLER** Kit. Full 16 digits, switches 5 functions, toll call restrictor, programmable, much more. Great for selective calling too! $79
- **AP-3 AUTOPATCH** Kit. Use with above for repeater autopatch. Reverse patch and phone line remote control std. $79
- **AP-2 SIMPLEX AUTOPATCH TIMING BOARD** Kit. Use with above for simplex autopatch $39
- **MO-202 FSK DATA MODULATOR** Kit. Run up to 1200 baud digital signals through any fm transmitter with full handshakes. Radio link computers, telemetry gear, etc. $39
- **DE-202 FSK DATA DEMODULATOR** Kit for rcvr end of link $39

RECEIVING CONVERTERS

		Antenna Input Range	Receiver Output
		28-32	144-148
		50-52	28-30
		50-54	144-148
VHF		136-138	28-30
MODELS		144-148	28-30
Kit with Case	$59	146-147	28-30
Kit less Case	$39	146-148	28-30
Wired w/case	$89	220-222	28-30
		220-224	50-54
UHF MODELS		222-224	28-30
Kit with Case	$69	432-434	28-30
Kit less Case	$49	435-437	28-30
Wired w/case	$99	432-436	144-148
		432-436	50-54
		439.25	61.25
		902-928	422-448
		902-922	430-450

See catalog for full line of 2w transmitting converters for vhf & uhf. Kits only $79. Linear Amplifiers avail. up to 50 w.

- **Send $1 for 36 page catalog by return mail.** (Send $2.00 or 4 IRC's for overseas mailing)
- **Order by phone or mail • Min $3 S & H per order**
- **Use Visa, Mastercard, Check, or UPS COD.**

Our 25th Anniversary

hamtronics, inc.

65-J MOUL ROAD•HILTON NY 14468-9535

Phone:716-392-9430 Hamtronics® is a registered trademark

73 Review by Arliss Thompson W7XU

Larsen HT Antenna Review

Larsen Electronics Inc.
11611 NE 50th Ave., PO Box 1799
Vancouver WA 98668

Price Class:	KD4-144	¼-wave Rubber Duck	$9
	KD4-144-ST	"Stubby"	$9
	KD4-144-HQ	¼-wave Collapsible	$12
	KD14-2M-HW	½-wave Collapsible	$18
	BNCQ	¼-wave BNC Male connector	$8

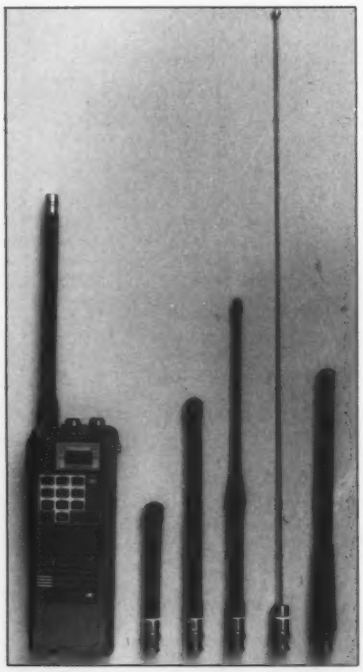


Photo A. (From left to right.) Kenwood TR-2500 handheld 2m transceiver with stock rubber-duckie, stout helical, standard rubber-duckie replacement, helical quarterwave, full-size ¼-wave, and collapsed ½-wave.

A ham often considers replacing the rubber-ducky that came with his handie-talkie with something that has better performance or a more compact size. What gain do these high performance models actually have? On the other side, how far down does communication effectiveness go with a "stubby-duck?" Are they worth the extra money?

Trip to Larsen

I had the opportunity to visit Larsen Electronics, in Vancouver, Washington, and toured the facilities with Jim Villasana. (The making of the antennas alone is worthy of an article.) This visit ended with the loan of four Kulduckie antennas (KD4-144, KD4-144-ST, KD4-144-HQ, and KD14-2M-HW) plus a BNCQ ¼-wave (Photo A).

These 5 models well represent what's available on the amateur market for replacement HT antennas, ranging from the KD4-144-ST stout helical to the KD14-2M-HW collapsible half-wave.

Two-Part Test

The comparisons involved two types of tests. The first sought quantitative (dB) comparisons of a given model to Kenwood's TR-2500 stock rubber-duckie. The second part of the test investigated the relative gain of the antennas under typical operating conditions.

Testing

A large, flat area of farmland served as the test range. The receive system consisted of a 3-element vertically-polarized yagi mounted approximately one wavelength above ground; a two-meter receive converter; a Kenwood TS-130S HF transceiver; and an attenuation box calibrated in 1-db steps. This was the receive system. The transmitter was a Kenwood TR-2500 outfitted located a few hundred feet from the receiver. The HT was held in position atop a wooden stepladder during the tests. This allowed normal (i.e. head-level) transceiver use, and reduced variations in signal strength due to movement. These conditions were definitely not equivalent to an antenna test range. The reader shouldn't view these results as gospel. They were in line, however, with theoretical values.

The Results

See the results in Table 1. Using the collapsible KD14-2M-HW ½-wavelength antenna as a standard, a BNCQ full-size ¼-wave was about 3 dB weaker. I obtained the same result with a model (KD4-144-HQ) that uses a part helical and part ¼-wave construction (sometimes known as a rubber-duckie with a "stinger"). In theory the full-size antenna is more efficient.

The standard Larsen helical antenna (KD4-144) and the stock Kenwood antenna gave identical results at 6 dB down from the ½-wavelength antenna. The stubby KD4-144-ST was an additional 3 db in signal strength below the ordinary rubber duck, or 9 db weaker than the ½-wave. These results are in fairly good agreement with measured and theoretical values (also shown in Table 1) for similar antennas that appear in the RSGB VHF/UHF Manual and in Reynold's article ("The ⅝-wavelength antenna mystique") in the ARRL's Antenna Compendium.

Below is an operational discussion of each antenna.

Stubby Duck

1) This is the smallest antenna of the lot. It has an overall length of 4-7.16 inches (a standard rubber duck is about 7-½ inches long), and a diameter just a hair under ½-inch. Expect a signal roughly 3 dB down from a regular antenna. Around-town repeater operation, however, showed no difference between this antenna and the stock antenna. On somewhat more distant repeaters, the short antenna was a bit more sensitive to location than the regular duckie. There were no instances, however, when the stock antenna allowed access to a repeater that the stubby couldn't hit.

KD4-144

The HT's standard antenna and the Larsen equivalent gave identical results. The Larsen exhibited only a slightly better SWR at resonance than the Kenwood unit. Note that for antennas of this kind, even with differences in quality of materials and workmanship, one is as good as the other. Both are 5 to 6 db weaker than the ½-wave antenna described later, but are less than 20 percent of the larger antenna's length. This represents a very reasonable compromise between size and performance with a handheld radio and antenna.

Helical ¼-wave "Extended Duckie"

Some hams swear by this antenna, shown with the other antennas in Photo A. The version tested was 3 inches longer than the standard rubber duck and provided about a 3 dB increase in signal strength relative to that an-

Continued on page 78

73 Book Review

A to Z, RFI, and Transformers

Three Definitive Radio References

reviewed by Larry Antonuk WB9RRT

The Technology Dictionary
edited by Charles Battle
Master Publishing, Inc. 1987
6″ x 9″, softbound, 174 pages, $6

New on the shelves at Radio Shack these days is *The Technology Dictionary*, a paperback meant to keep the "business, school, or home abreast of meaning of terms of the leading-edge technologies". The dictionary contains 2500 current and not-so-current terms—150 of them illustrated with line drawings or photographs.

Covering everything from Abacus to Zero Suppression, the book leans heavily toward the computer and telephone installation fields. Amateur radio operators will find their hobby has, for the most part, been neglected. Terms like CTCSS, repeater, RF link, and handheld are missing. CW or PL are defined, although somewhat misleadingly. However, these deficiencies are more than made up for by the broad coverage of the computer and digital logic fields.

Rather than cluttering up the text with all the possible acronyms used in the electronics field (DPDT - See also Double Pole Double Throw), the editor chose to devote six pages in the front of the book to "Abbreviations, Acronyms, and Symbols". If the acronym is listed, it's a simple matter to look up the corresponding term in the dictionary section of the book.

The Technology Dictionary does its job well. Who uses a dictionary like this? The back cover lists "the layman, technician, professional, engineer, or persons just being introduced to the technology". The definitions read like test answers in EE 101—enough to show that you know what they're talking about, but not enough to prove that you really understand the concept.

Let's say you're at lunch with the boys, and the conversation swings over to "epitaxial transistors". You flip through *The Technology Dictionary* and find that an epitaxial transistor is simply "a transistor having a layer of crystalline material deposited on the original substrate material and oriented in the same way as the original substrate". Hmmmm. Does this mean that you can now leap into the discussion? Ask intelligent questions? Why do you eat lunch with people like that anyway?

A little knowledge may be a dangerous thing, but where else can you get dangerous for six bucks? *The Technology Dictionary* will make a great stocking stuffer for the electronic newcomer, college student, or buzzword enthusiast.

Radio Frequency Interference
edited by C.L. Hutchinson and M. B. Kaczynski
The American Relay League, Inc. 1987.
8″ x 11″, softbound, 75 pages, $4

The complete title of this work is *Radio Frequency Interference, How To Identify and Cure It.* This aptly sums up the contents of the manual. Every facet of the RFI problem is covered in detail.

The early chapters deal with the history of radio interference (would you believe as early as 1925?). Diplomatic concerns are given thorough treatment: the importance of an RFI committee, how to deal with the offended parties, and how to deal with the FCC, if necessary.

Recognizing the source of the noise is sometimes the most difficult part of the process. Two major categories cover various sources of RFI: interference *to* hams, and interference *from* hams to consumers. Once we understand the source of RFI, we can attempt to solve the problem. Practically every imaginable source of interference is covered. CB radios, ham transmitters, power lines, electric motors, water heaters—all with specific information on noise suppression.

The highlights of the book are found in the "Additional Sources of Assistance and Information" section. First is an address list of consumer electronics manufacturers, with a short description of how they handle RFI complaints. Next comes a bibliography of published material available on the RFI topic. The manual is finished off with a section on the available high-pass, low-pass, and power line interference filters. Attenuation figures and fourteen pages of frequency response graphs are given, all by brand name. This last feature will be of great use to anyone in need of a filter; all the research has been done!

Radio Frequency Interference is lacking in only one department, home and automotive computers. (Possibly saved for another publication?) At any rate, four dollars spent on this manual could save countless hours and untold aggravation. At less than the price of a movie ticket, it belongs on every ham's bookshelf.

Transmission Line Tranformers
by Jerry Sevick, W2FMI
The American Radio Relay League, Inc. 1987
6″ x 9″, hardcover, 132 pages, $10

In the preface, W2FMI gives us a hint as to the tone of his handbook. The author states that, while doing research on transmission line transformer theory, he came to the point where he could either have written six to eight research papers or published them all as a book. He decided on the book.

Transmission Line Transformers certainly reads better than the average research paper, but it's not exactly light reading. The book will be quite enjoyable, however, to those hams mainly interested in RF and antenna design, since it represents the first rigorous study of the various design parameters used with these devices.

Starting with a short history of the transmission line transformer, the author gives a complete mathematical analysis of the derivation of the unit. Information on how to design and build the various types of transformers follows, classified by application and impedance ratios. Complete chapters are devoted to baluns and to materials and power ratings. The final chapters concern simple homebrew test equipment used to test and refine devices built in the workshop. Photographs, schematics, and graphs are generously spread throughout the text, making the book much more readable and understandable.

While not a research paper, neither is this a cookbook. If you need a transformer for a specific application, you won't find directions on how to wind it. You *will* learn how to design it, however, a more time-consuming, but certainly a more rewarding approach. And once you've wound your coil, hooked it up, and it doesn't work (!), you'll be better prepared to figure out why.

As impressive as it looks on the coffee table, *Transmission Line Transformers* may be somewhat beyond non-technical hams. For the hard-core RF types, W2FMI has come up with a reference work that will find its place next to *The Antenna Book*, *The Handbook*, and *Solid State Design*, well used, dog-eared, and always within reach. 73

Ultra-Convenient Mobile Antenna for Two Meters

A Harada AM/FM/CB antenna on VHF

Ivan T. Lorenzen W4JC

The removable whip antenna may seem at first a necessary evil. It often needs removal before driving the car in and out of a garage. Another factor is frequent vandalism in shopping mall parking lots. It's a lot cheaper to remove the whip antenna and put it in the trunk than to repeatedly replace bent, broken, or stolen whip antennas.

Because removing this antenna was so inconvenient, however, I investigated the feasibility of using a 12-volt AM/FM/CB power antenna. After all, the two-meter band is very close to the 5th harmonic of 27 MHz.

In the spring of 1979, my car was equipped with a Harada Model TW-85 power antenna designed for AM/FM/CB. A Leader model LAC-897 two-meter antenna matcher with built-in SWR/Power meter plugged in between the transceiver and the AM/FM/CB power antenna. The power antenna worked great. I soon installed a duplicate antenna on the rear fender and permanently connected to it a home-brew matcher, similar to the LAC-897 circuit.

Field strength readings at several points around a 360-degree circle showed virtually no difference between the power antenna and the ⅝-wave base-loaded whip mounted in the same hole on the rear fender.

This system performed very well after installation on a new car in 1982, and July 1987 saw the system on yet another new car. The car dealer wanted to keep the power antenna on the trade-in, however, because a hole plug in the rear fender wouldn't look nice.

Using the MT-2

A Harada Model MT-2 AM/FM/CB power antenna went on the rear fender of the new car. It extends 42 inches above the fender in the raised position, like the previous model. This easily clears the garage door opening.

A little more experimenting on the current system showed that an even simpler matcher works perfectly. (See Figure 1.)

The transceiver is a Kenwood TM-2530A with a rated RF power output of 25 watts. After 10 minutes of continuous-transmit operation, the top loading coil in the antenna doesn't even get warm. (For high power, however, increase power in incremental steps and check for heating. Harada doesn't furnish RF power handling capabilities of their AM/FM/CB antennas.)

The MT-2 antenna comes with a 59-inch length of RG-58/U and a Motorola-type male connector. Since this length of coax works perfectly well with the simple matcher shown above, there is no point in shortening it to save a few tenths of a dB, and possibly run into unpredictable changes in impedance matching.

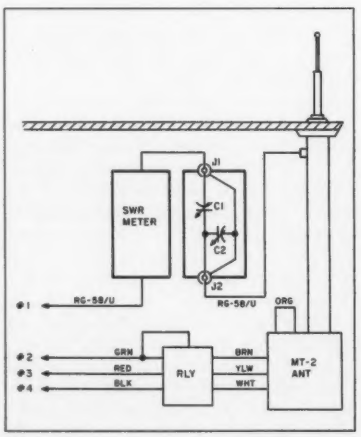


Fig. 1.

The parts list includes:

- J1 SO-239 socket
- J2 Motorola-type socket (Alternative: SO-239 and a Motorola-to-PL-259 adaptor)
- C1 15 pF air variable capacitor (ungrounded rotor)
- C2 15 pF air variable capacitor

The aluminum chassis box enclosing the matcher is approximately 2 x 2 x 4 inches with an SO-239 socket at the input and a Motorola-type female socket at the output. This prevents inadvertent reversal when making connections to the SWR meter and to the antenna. The SWR meter is a $20 generic Ham/CB type, approximately 2 x 2 x 5 inches.

For mounting ease on the car trunk, connect the SWR meter to the matcher side by side, using two M-359 right-angle adaptors and a double PL-259 adaptor. Mount the input SO-239 socket close to the edge on the end of the chassis box so the adaptor connectors will reach the two units. One or two home-made S-hooks made from heavy aluminum clothesline wire permits hanging the SWR meter/matcher on the fiberboard trunk liner.

The SWR is practically 1:1 with the plates of both capacitors approximately half-meshed. Comparative field strength readings are virtually equal to those of a base-loaded ⅝-wave whip.

One switch mounted near the transceiver turns the two meter rig on and raises the antenna. This antenna will cost more than a regular whip antenna, but the no-nonsense convenience and operational effectiveness of this setup is a real pleasure. 73

The author began his engineering career in 1933, working in commercial communications and broadcasting until joining the FCC in 1940. He retired in 1973 after service as Chief of the Monitoring Systems Division and Acting Deputy Chief of the Field Engineering Bureau. You can write to him at 320 Artemis Blvd., Merritt Island, FL 32953.

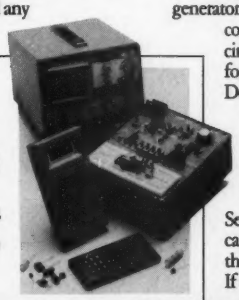
NRI's At-Home Training in Electronic Design Technology Can Put You in a High-Paying Career as an In-Demand Design Technician

The best jobs in electronics today go to the people who have the skills to think and work creatively. Conceive and design circuits and equipment. Initiate ideas and carry them through. Now NRI can help you be one of these people—design technicians who command up to $22,000 as starting salaries, earn $35,000 or more with experience.

NRI's Electronic Design Technology course starts you with the fundamentals and builds from there to prepare you for an electronics career with real growth potential!

No Previous Experience Necessary

Even if you've never had any previous training in electronics, you can succeed with NRI training. You start with the basics, then rapidly build on them to master advanced electronics concepts.



Your hands on training includes all this: the unique NRI Circuit Designer, a solderless breadboarding system you build and use for circuit design, prototype construction, component evaluation, and testing... the NRI Model 2500 10 MHz triggered sweep oscilloscope, invaluable in elctronic troubleshooting . . . a TI-30 calculator for fast, accurate computations... and 3-½ digit, hand-held digital multimeter you learn to use as professionals do to perform electronic tests and measurements.

NRI Circuit Designer Gives You Invaluable Hands-On Experience

The heart of your lab training is the exclusive NRI Circuit Designer you build. It's a totally unique instrument with full breadboarding capability, built-in multiple power supplies, and a multifunction signal generator for circuit testing. Fast, simple connections let you create prototype circuits, immediately check them out for function or faults. Your Circuit Designer will handle both linear and digital integrated circuits as well as discrete components such as transistors and diodes.

Send for FREE Catalog

Send the coupon today for NRI's free catalog that gives you all the details about the Electronic Design Technology course. If the coupon is missing, please write to NRI School of Electronics, 3939 Wisconsin Avenue, Washington, DC 20016.

Send coupon today for free NRI catalog.

NRI SCHOOL OF ELECTRONICS

McGraw-Hill Continuing Education Center
3939 Wisconsin Ave. Washington, D.C. 20016

Please send information about NRI training in Electronic Design Technology.

Name (Please Print) Age

Address

City/State/Zip

#51-038

CIRCLE 312 ON READER SERVICE CARD

313-469-4656
28360 South River Rd.
Mt. Clemens, MI 48045

Michigan Radio

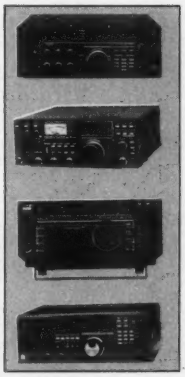
SALES *SERVICE*

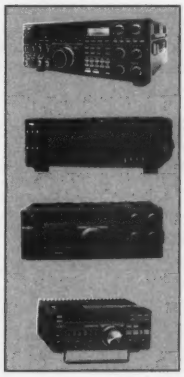
WE NOW HAVE

*ALL PRICES SUBJECT TO CHANGE

ICOM		LIST	OURS!
IC-761	Delux gnrl cvrg xcvr/pa/at ICOM'S BEST!!!	2499.00	2149.95
IC751A	Gnrl cvrg xcvr/keyer/cw filtr DXpedition Proven!!!	1899.00	1454.95
IC-735	Gnrl cvrg xcvr/QSK/compact	999.00	859.95
	Big performance/small size!		
R-71A	Hi performance receiver The DXers Choice!!!	979.00	839.95
R-7000	25-2000 mHz scanning rcvr The Super Scanner!!!	1139.00	979.95
IC-27A	25w 2m mobile xcvr/DTMF mic	429.00	369.95
IC-27H	45w version of above	459.00	389.95
IC-37A	25w 220 mobile with DTMF mic	499.00	424.95
IC-47A	25w 440 mobile with DTMF mic	549.00	469.95
IC-28A	Compact 25w 2m mobile/DTMF mic	459.00	399.95
	e-x-t-e-n-d-e-d rx coverage!		
IC-28H	45w version of above	499.00	424.95
IC-38A	Compact 25w 220 mobile/DTMF	499.00	424.95
IC-48A	Compact 25w 440 mobile/DTMF	499.00	424.95
	all of these ICOM VHF/UHF rigs		
	INCLUDE THE CTCSS (PL)!!!		
IC-471A	All mode 70cm xcvr	1049.00	809.95
	PRICED TO CLEAR THEM OUT!		
IC-275A	Deluxe all mode 2m/pa/25w ICOM'S latest all mode!!!	1235.00	1059.95
IC-275H	NEW 100w 2m all mode w/pa The Grid Square Getter	1399.00	1199.95
IC-375	NEW 220 all mode/25w/pa Another first from ICOM!	1399.00	1199.95
IC-475A	NEW 70cm all mode/25w/pa	1399.00	1199.95
IC475H	NEW 100w 70cm all mode/pa The biggest gun for UHF!	1599.00	1374.95
IC-900	NEW remance control multi-band FM xcvr. NEAT!!!	599.00	504.95
IC-2AT	1.5w 2m synthesized HT	319.00	274.95
	The IC-2AT has been in production longer than any other HT produced for the Ham market. Time tested, tried and true!!!		
IC-3AT	220 version of IC-2AT	349.00	299.95
IC-4AT	440 version of IC-2AT	349.00	299.95
IC-02AT	2m HT/10 mem/ctcss/DTMF	409.00	349.95
	5 watt version w/BP7		
IC-03AT	2.5w 220 HT/ctcss/DTMF Great for novices!!!	449.00	389.95
IC-04AT	3w 440HT/ctcss/DTMF	449.00	389.00
	Get away from the crowd—go 440!		
IC-u2AT	Micro 2m ht/ctcss/DTMF/mems	329.00	289.95
IC-u4AT	Mini 440 ht/ctcss/DTMF/mems	369.00	319.95
	Looking for a small ht with big features? Check out the ICOM MICRO line hts.		

WE STOCK A COMPLETE LINE OF ACCESSORIES.
CALL US FOR INFORMATION,
RECOMMENDATIONS & OUR LOW PRICES.



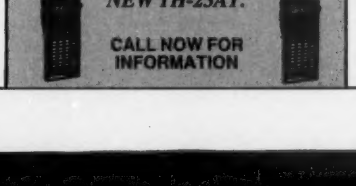


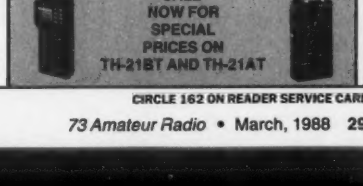
KENWOOD		LIST	OURS!
TS-940s	Super gnrl cvrg xcvr w/at	2349.95	1999.95
	without at	2119.95	1799.95
TS-930s	Gnrl cvrg xcvr/pa/notch w/at DXcellence!	1999.95	1699.95
TS-830s	Quality transceiver	1199.95	1014.95
TS-440s	Compact xcvr/99 meme		
	108db dynamic range! w/at	1299.95	1099.95
	without at	1099.95	929.95
TS-140s	Compact gnrl cvrg xcvr	899.95	764.95
	DXciting price!!!!!		
TS-680s	Compact gnrl cvrg xcvr	999.95	849.95
	WITH SIX METER COVERAGE!!!		
R-5000	102 dB range SW receiver 100 Memory Channels!!!	949.95	774.95
R-2000	General coverage receiver 10 memories/2 clocks	699.95	569.95
TM-2530	25w 2m mobile/DTMF	450.95	389.95
TM-2550	45w 2m mobile/DTMF	499.95	414.95
TM-2570	70w 2m mobile/DTMF	599.95	499.95
TM-3530	25w 220 mobile/DTMF	479.95	404.95
	Kenwood's 25/35 series radios are DCS/DCL compatable.		
TW-4100	2m/440 dual band mobile	699.95	589.95
TH-21BT	Mini 2m xcvr/DTMF/ctcss	279.95	219.95
TH-31BT	220 version 21BT	299.95	234.95
TH-41BT	440 version 21BT	299.95	234.95

KENWOOD		LIST	OURS!
TH-25AT	NEW MINI 2M SYNTHESIZED HT!!!	329.95	294.95
TH-205AT	2m 3w ht/3 memories Affordable HT!!!	279.95	234.95
TH-215AT	2m 3w ht/10 memories/ctcss	359.95	314.95
TH-315AR	220 3w ht/10 memories/ctcss	379.95	324.95
TH-415AT	2.5w 440 ht/10 mems/ctcss	379.95	324.95
TM-221A	45w mobile w/DTMF mic	419.95	354.95
TM-321A	220 version of 221	439.95	374.95
TM-421A	35w mobile 440 w/DTMF mic	439.95	374.95
TR-751A	2m all mode mobile	629.95	534.95
TS-711A	Deluxe 2m all mode w/pa	999.95	849.95
TS-811A	Deluxe 70cm all mode w/pa	1199.95	1014.95

TEN TEC		LIST	OURS!
585 PARAGON	Super HF transceiver TNE transceiver	2245.00	1904.95
561 CORSAIR II	HF transceiver	1445.00	1239.95
525D ARGOSY II	Economy HF transceiver	745.00	639.95
RX-325	Compact gnrl cvrg rcvr	699.00	574.95
2591 HT	2m synthesized HT	319.00	274.95
2510	Satellite station	549.00	474.95

YAESU		LIST	OURS!
FT-980	Deluxe gnrl cvrg HF xcvr	1795.00	1499.00
FT-767	Super xcvr/pa/at/mic/accepts modules for VHF/UHF	1929.95	1694.95
FT-757II	New, improved version 757	1129.95	974.95
FT-747GX	NEW!! Economy HF XCVR	899.95	754.95
FT-736R	NEW!!! multimode VHF/UHF	1749.95	1499.95
FT-726R	Multiband VHF/UHF all mode	1085.00	CALL!!!
	WE'VE GONE NUTS!!! WE'RE PRACTICALLY GIVING AWAY FT-726R!!!		
FRG-8800	Gnrl cvrg rx/10 mems/key entry	759.95	624.95
FRG-9600	Scanning VHF/UHF receiver	699.95	494.95
FT-727RH	2m/440 hi MEM CPUI The first dual band HT!!!	439.95	359.95
FT-108RH	220 HT/5w/scanning/memories	399.95	329.95
FT-208RH	2m HT/5w/scanning/memories	399.95	329.95
FT-708RH	440 HT/5w/scanning/memories	399.95	329.95
FT-23R	Mini 2m HT/DTMF	399.95	334.95
FT-33R	Mini 20 HT/DTMF	399.95	329.95
FT-73R	Mini 440 HT/DTMF	349.95	319.95
FT-211RH	2m 45w autodialer mobile	449.95	389.95
FT-311RM	220 25w version FT-211RH	439.95	384.95
FT-711RH	440 35w FM autodialer mobile	479.95	414.95
	Limited number w/ autodial microphone		
FT-212RH	High Tech 45w 2m mobile	459.95	399.95
FT-712RH	High Tech 35w 70cm mobile	499.95	434.95





CIRCLE 162 ON READER SERVICE CARD

New PK-232 Breakthrough

Six Digital Modes - Including Weather FAX

A new software enhancement makes the AEA PK-232 the only amateur data controller to offer six transmit/receive modes in a single unit.

* Morse Code
* Baudot (RTTY)
* ASCII
* AMTOR
* Packet
* Weather FAX

$319.95 AMATEUR NET
$379.95 AEA RETAIL

Your home computer (or even a simple terminal) can be used for radio data communication in six different modes. Any RS-232 compatible computer or terminal can be connected directly to the PK-232, which interfaces with your transceiver. The only program needed is a simple terminal program, like those used with telephone modems, allowing the computer to be used as a data terminal. All signal processing, protocol, and decoding software is in ROM in the PK-232.

The PK-232 also includes a no compromise VHF/HF/CW modem with an eight pole bandpass filter, four pole discriminator, and 5 pole post detection low pass filter. Experienced HF Packeteers are reporting the PK-232 to have the best Packet modem available.

Operation of the PK-232 is a breeze, with twenty-one front panel indicators for constant status and mode indication. The 240 page manual includes a "quick start" section for easy connection and complete documentation including schematics. Two identical back panel radio ports mean either your VHF or HF radio can be selected with a front panel switch. Other back panel connections include external modem disconnect, FSK and Scope Outputs, CW keying jacks, and RS-232 terminal interface.

The RS-232 connector is also used for attaching any Epson graphics compatible parallel printer for printing Weather Fax. Weather maps and satellite photos, like the one in this ad, can be printed in your shack.

Contact your local AEA dealer today for more information about the one unit that gives you six modes for one low price, the PK-232.

AEA Brings you the Breakthrough

2006-196th St. SW
Lynnwood, WA 98036
(206) 775-7373

Circle No. 315 on Reader Action Card

73 Review

by Bryan Hastings KA1HY

WSE WP-727DX Docking Booster and Com-Rad CR2/4A Dual-band Antenna

World Systems Engineering Co., Ltd.
c/o Naval Electronics, Inc.
5417 Jetview Circle
Tampa FL 33634
Price Class: $349

Com-Rad Industries
1635 West River Rd.
PO Box 554
Grand Island NY 14072-0554
Price Class: $55

Photo A. World System's Electronics WP-727DX 2m/70cm docking booster, which accommodates five recent makes of Yaesu HTs.

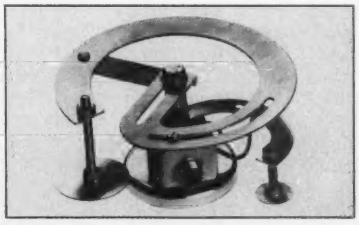


Photo B. Com-Rad's CR2/4A 2m/70cm mobile antenna. Shown here with the mag-mount, it stands only 4" high.

HTers may recall the Yaesu FT-727R 2m/70cm dual-band handie review in the December issue. The items reviewed here convert the FT-727 into a 18W/25W dual-band mobile station!

THE POWER BOOSTERS

World Systems Engineering's WP-727DX Docking Booster can be used with the Yaesu FT-203, -703R, -209, -709, and -727 HTs. The "boosted" HT in this review is the Yaesu 727R dual-band handie. It is an attractive and compact unit: a matte black aluminum case measuring 6" wide x 4½" tall x 2" deep. The 2" wide door mounting brace fits over the door panel between the inside face and the door window. The test vehicle was a Dodge Colt on whose door panel the booster fit perfectly.

The FT-727DX is a straightforward piece of gear. There are only two switches. One is a three-position toggle to switch the unit between high power, low power, and off. The other is a toggle to switch in the GaAsFET receiver pre-amp. The low-power setting switches the power amp out-of-line. Three LEDs, located on the top panel along with the switches, indicate power, pre-amp activation, and transmit mode.

RF power into the booster enters through a male BNC connector, and RF goes out to the antenna via an SO-239. There is a small mike-hanger bracket on the front panel. That, plus the 13.8V power cable, is all there is to it! The booster automatically selects the operating band and transmit/receive mode.

A Brief Look Inside

The components are sensibly mounted on a glass epoxy board, with heat-sensitive components on the lower, somewhat cooler, half of the vertical board. The solid-state final amp, a Toshiba S-AU3, is mounted on the left panel, looking at the front of the unit. The review unit mounted on the Colt passenger door panel, which positioned the final amp heatsink right in front of the car's air vent. Care was required when using the car heater to allow the sink adequate dissipation.

Operation

Mounting the FT-727 HT is also very simple—just remove the battery pack and slide it on the gray track. WSE should consider installing a securing bracket to bind the rig to the booster, because the 727 slid off a few times during the two-month operating period.

The "manual" is a single photocopied sheet, and it lists the booster's features, specifications, and operating cautions. The instruction sheet also shows a diagram of the top control panel and a photocopy of a photo of the 727 installed in the booster. There are no schematic or troubleshooting guides.

The booster didn't give a whit of trouble during its two months of casual use. The RF-sensed switching hardly slowed down even at times when the car's air temperature was near freezing. Signal reports were always Q-5 when solid into the repeater.

The booster in conjunction with the Untenna enabled me to regularly key up repeaters up to 50 miles away. On a recent trip from Ottawa to Montreal, I had solid access for 90 miles of the 120-mile distance to a repeater located halfway between the cities. On a previous trip along the same route, a 10-watt unit with a ⅝"-wave base-loaded whip gave solid access only 30 miles on either side of the repeater.

The GaAsFET preamp made a distinct difference in signal reception. S-6 signals became S-8 to S-9 with the preamp switched in.

A Bird Wattmeter and dummy load proved useful to measure power out of the booster on the high power setting for the two bands. At a hair under 14 VDC, 2m output was 28 watts, and 70cm output was 13 watts.

A problem could arise from the power line fuse in-line too close to the booster (a foot from the unit). More often than expected, the the DC-line insulation wears away at friction points, often on the metal edge of the car's firewall hole, through which the lines pass. The fuse should be as close as possible to the positive battery terminal to prevent shorting the battery. Check this potential hazard by putting another fuse in the positive line near the battery's "+" terminal.

THE "UNTENNA"

The Untenna was sitting at home on the coffee table home when a friend dropped by and, viewing this curious object on the table, commented on what a nice piece of abstract metal sculpture it was! It reminded another friend of an imcomplete heating element for an electric stove.

Clearly, the CR2/4A looks like anything but an antenna. It consists of two broad, flat, curved metal elements. It has a maximum diameter of 7 inches and, including the mag-mount, stands only 4½ inches high. It's hard to imagine that this little antenna's perform-

Frequency	144/430 MHz band
RF Power Output	30 watts/18 watts
RF Input Power	2–5 watts
RF preamp gain	15dB
Current Drain	6A Maximum
Input/Output Impedance	50Ω

Fig. 1. WSE WP-727DX Docking Booster Specifications.

Frequency	VHF	140–170 MHz
	UHF	430–470 MHz
Maximum Power		200 watts
Net Wt.		1.5 lbs
Height (with Radome)		5″
without radome and without mag-mount		2-½″

Fig. 2. Com-Rad CR2/4A Dual Band Antenna Specifications.

ance actually rivals that of a ¼-wave vertical! See the sidebar for a little theory on this low-profile antenna.

Antenna Set-Up and Tuning

Setting up the antenna takes just a few minutes, once fluent with the procedure (Refer to Photo B).

The antenna mounts on the roof of the car, with the SO-239 connector aimed rearward so wind doesn't force moisture into it. Connect the antenna to the rig with an SWR meter in-line for the desired bands.

First tune the impedance-matching lug, which slides along the groove in the element. This is factory set, so this tune can usually be skipped. The next step is to adjust the height above the ground plane (the car roof) of the capacitive tuning disk. This disk is located on the end of a threaded rod that drops down from the end of the radiating element. There is a lockwasher and nut on the threaded rod to secure it.

The steps are the same for tuning either the 2-meter or 440 MHz element.

Test and Performance

Preliminary tests at the *73* range concur with Com-Rad's claim that the CR2/4A has the gain of a ¼ wave whip. Comparing the CR2/4A to a ⅝ wave base-loaded whip, the signal reports on the test receiver for the two antennas were within an S-unit of each other. Consider this only an initial test. An RF attenuator is needed to more accurately measure the dB difference between the two antenna signals.

The CR2/4A is very high-Q antenna. Narrow bandwidth, by definition, reduces intermodulation (IMD), but limits the number of operable channels on the band without retuning. When the CR2/4A is tuned to resonate at 146 MHz, the operable bandpass is from 145.5 to 146.5. SWR is 3:1 at these two end frequencies.

The 440 MHz element was much more broad-banded. Minimum SWR was 1.25:1 at a resonant frequency of 445 MHz. This requires the tuning plate set as far away from the ground plane as possible. The SWR, however, went up only to 1:35:1 and 1.4:1 at 440 and 450 Mhz, respectively.

Operation

On-the-road use also showed the CR2/4A gain competes with the ¼-wave. The antenna didn't detune from the resonant frequency during the several months of operation. Small amounts of snow and ice on the elements do not appear to affect the antenna's tuning either. The test unit arrived with a protective plastic dome that attaches to the top of the antenna's vertical post, to keep it virtually snow- and ice-free. Buyers have an option of either a magnetic or Motorola-type NMO direct mounts.

CONCLUSIONS

The 727DX is a solid piece of gear in every respect. It is attractive, easy to use, well-made, and gave trouble-free operation. *73* tests for power output concurred with the maufacturer's tests, although the RF pre-amp gain was not checked.

Both preliminary dB measurements and operating experience indicate the CR2/4A has comparable gain to a ¼-wave vertical whip. Furthermore, it appears to be a solid, reliable antenna. The only drawback is its narrow bandwidth on two meters. The operator must retune the antenna if he wants to use a repeater more than 500 kHz off the resonant frequency. This antenna is ideal, however, for the operator who uses only one repeater, or a group of repeaters clustered together.

Thanks to Larry Antonuk WB9RRT who co-tested the booster and Untenna, to Arliss Thompson W7XU who provided printed materials on the DDRR, and to both for their technical assistance. Happy 2m/70cm mobiling! 73

DDRR Antennas

Directional-discontinuity ring-radiator antennas first captured engineers' interests in the early 1960s. Most of the early studies involved new designs for small, vertically polarized, omnidirectional HF antennas, but the theory applies to VHF radiators, also.

Vertical antennas are desirable for general purpose communications, since they offer omnidirectional radiation patterns. A grounded quarterwave antenna has very good radiation efficiency, since its radiation resistance is greater than any electrical loss due to conductor resistance. Shortened verticals that use loading coils to restore resonance become much more inefficient, since a shorter radiator decreases radiation resistance. A short antenna has less surface area (aperture) with which to radiate.

One way to shorten the vertical height of an antenna is to lay it on its side. The DDRR antenna does just that, yet the circular radiating surface area (aperture size) is the same as that of a full-height quarterwave antenna. A ten to 30 times reduction in height is possible with a DDRR.

DDRR antennas have some interesting characteristics. A circular antenna with a circumference of one quarter wavelength has a diameter of approximately 0.078λ. For the two meter band, the diameter is approximately 6½″. The antenna's natural resonance is unaffected by height above the ground plane, provided this height is much than a quarter wavelength.

The area between the circular conductor and ground plane forms a curved boundary region or "slot." This slot initiates the radiation when a signal source is connected across it. Strictly speaking, the DDRR is a type of transmission line radiator, like a slotted waveguide. The horizontally polarized wave, which arises from the current flowing in the ring itself, combines with the complementary current image to cancel out all horizontal radiation. The vertically polarized radiation arises from the countinuous change of direction, or discontinuity, of the slot as it curves around.

The radiation pattern of a theoretical DDRR looks very much like a dipole's "doughnut" pattern. In the azimuthal plane the pattern is circularly symmetric; i.e., equal in all directions. In practice the radiation depends very much on the symmetry of the ground plane, and so a mobile VHF DDRR should be mounted as near as possible to the center of the vehicle's roof.

Impedance matching is carried out by adjusting the distance of the transmission line feedpoint from the end of the antenna. The DDRR actually permits direct connection of 30 to 500Ω transmission lines by adjusting the actual feedpoint. Once matched, the antenna can be capacitively tuned over a 2:1 frequency range without exceeding a 2:1 VSWR.

The bandwidth of any antenna is inversely proportional to its characteristic impedance, Z_o. A low Z_o implies large conductor widths and spacings, which subsequently mean a bigger antenna. Small antennas have relatively narrow bandwidths, and the DDRR is no different. In fact, the DDRR acts as a sharp bandpass filter at the resonant frequency, which can help reduce adjacent channel interference or intermodulation products in the receiver.

References

Boyer, J.M. "Hula Hoop Antennas—A Coming Trend?" Electronics (1963): 44–46.

Burton, R.W. and King, Ronold W.P. "Theoretical Considerations and Experimental Results for the Hula-Hoop Antenna."The Microwave Journal (November 1963): 89–90.

Fenwick, R.C. "A New Class of Electrically Small Antennas." IEEE Transactions on Antennas and Propagation.

Rudge, A.W., Ed. The Handbook of Antenna Design. Vol. 2. VLF, LF, and MF Antenna chapter by John S. Belrose. Peter Peregrinus, Ltd., London, 1983.

WE SHIP WORLDWIDE

Barry Electronics Corp.

WORLD WIDE AMATEUR RADIO SINCE 1950

Your one source for all Radio Equipment!

For the best buys in town call:
212-925-7000
Los Precios Mas Bajos en Nueva York...

KITTY SAYS: WE ARE NOW OPEN 7 DAYS A WEEK.
Saturday & Sunday 10 to 5 P.M.
Monday-Friday 9 to 6:30 PM Thurs. to 8 PM
Come to Barry's for the best buys in town.

ICOM

IC-R71A, 751A, 745, 28A/H, 38A, 48A, Micro2/4, R-7000, IC-761, IC-375A, 275A/H, 3200A, 475A/H, 735, IC-900 **IC-781**

ONV Safety belts-in stock

"March into BIG SPRING SAVINGS at BARRY'S"
See you March 13 at WECA—Valhalla, NY

YAESU
FT-767GX, FT-757GXII, FT-311 RM, FRG-8800, FT-736, FRG-9600, FT-211/711RH, FT-2700RH

SMART PATCH
CES Simplex Autopatch 510-SA Will Patch FM Transceiver To Your Telephone Great For Telephone Calls From Mobile To Base Simple To Use. 510SA/510SAII

KENWOOD

Antennas
A-S
Cushcraft
Hy-Gain
Hustler
KLM
METZ
Mini-Products
MULTIBAND
Mosley
MODUBLOX
TONNA

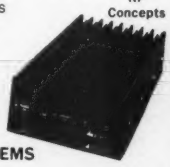
TS440S/AT, R-5000, R-2000, TS-940 S/AT, TM 221A/421A, TM-2570A/50A/30A, TR-751A, Kewood Service /Repair, TH 21/31/41 BT, TS-711/811A, TM3530A, TH205AT, TH215A, TW-4100A, TM-321A, TS-140S,TS-680S

YAESU FT-23/73/33/727R, FT-2/1/709R/H, FT-1903/1123, FTH-2005/7005

ICOM IC2AT/12AT, ICO2AT, IC-03/04AT, IC-A2/U16

Land-Mobile H/T
Midland/Standard
Wilson Maxon
Yaesu FTC 1123, FTC 1143
ICOM IC-M5 (Marine) M700
Tempo M-1

RF Concepts



PRIVATE PATCH IV, Duplex 8000

NYE MBV-A 3 Kilowatt Tuner

Budwig ANT. Products
NEL-TECH DVK-100 Digital Voice Keyer
FLUKE 77 Multimeter
Media Mentors—
Amateur Radio Course $99.95

VoCom/Mirage/Alinco
Tokyo Hy-Power/TE SYSTEMS
Amplifiers &
5/8λ HT Gain
Antennas IN STOCK

AMERITRON AMPLIFIER AUTHORIZED DEALER

ALINCO ALD-24T, ALR-206T

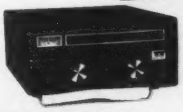
SANTEC
ST-222/UP
ST-20T
ST-442/UP
HT-7

MFJ-989B

Soldering Station,
48 Watts, $68
MICROLOG-ART 1, Air Disk, SWL, Morse Coach

Computer Interfaces Stocked: MFJ-1270B, MFJ-1274, MFJ-1224, AEA PK-87, PM-1, PK-232 W/FAX

Yaesu FTR-2410, Wilson
ICOM IC-RP 3010 (440 MHz)
ICOM IC-RP 1210 (1.2 GHz)
ICOM IC-RP 2210 (220 MHz)



Ten-Tec Tuner 229B

KANTRONICS
UTU, KAM, UTU-XT, KPC 2400, KPC IV

EIMAC
3-500Z
572B, 6JS6C
12BY7A &
6146B

BIRD
Wattmeters &
Elements
In Stock

Complete Butternut Antenna Inventory In Stock!

DIGITAL FREQUENCY COUNTERS
Trionyx, Model TR-1000, 0-600 MHz

AMP SUPPLY STOCKED
Long-range Wireless Telephone for export in stock

BENCHER PADDLES
BALUNS, LOW PASS FILTERS IN STOCK

MIRAGE AMPLIFIERS
ASTRON POWER SUPPLIES
Saxton Wire & Cable, Int'l Wire

HEIL EQUIPMENT IN STOCK

SANGEAN Portable Shortwave Radios

Tri-Ex Towers
Hy-Gain Towers & Antennas, and Roters will be shipped direct to you FREE of shipping cost.

AEA 144 MHz
AEA 220 MHz
AEA 440 MHz
ANTENNAS

New TEN-TEC
Corsair II, PARAGON, Argosy II

MAIL ALL ORDERS TO: **BARRY ELECTRONICS CORP., 512 BROADWAY, NEW YORK CITY, NY 10012 (FOUR BLOCKS NORTH OF CANAL ST.)**

New York City's LARGEST STOCKING HAM DEALER
COMPLETE REPAIR LAB ON PREMISES

"Aqui Se Habla Espanol"
BARRY INTERNATIONAL TELEX 12-7670
MERCHANDISE TAKEN ON CONSIGNMENT FOR TOP PRICES
Monday-Friday 9 A.M. to 6:30 P.M. Thursday to 8 P.M.
Saturday & Sunday 10 A.M. to 5 P.M. (Free Parking)
AUTHORIZED DISTS. MCKAY DYMEK FOR SHORTWAVE ANTENNAS & RECEIVERS.
Subways: IRT/LEX-"Spring St. Station"
BMT-"Prince St. Station"
IND-"F" Train-Bwy. Station"
Bus: Broadway #6 to Spring St.
Path—9th St./6th Ave. Station.

Commercial Equipment Stocked: ICOM, MAXON, Midland, Standard, Wilson, Yaesu. We serve municipalities, businesses. Civil Defense, etc. Portables, mobiles, bases, repeaters...

Wanted: Full time Technicians

We Stock: AEA, ARRL, Alpha, Ameco, Antenna Specialists, Astatic, Astron, B & K, B & W, Bencher, Bird, Butternut, CDE, CES, Communications Spec., Connectors, Cushcraft, Daiwa, Dentron, Digimax, Drake, Eimac, Encomm, HeilSound, Henry, Hustler (Newtronics), Hy-Gain, Icom, KLM, Kantronics, Larsen, MFJ, J.W. Miller, Mirage, Newtronics, Nye Viking, Palomar, RF Products, Radio Amateur Callbook, Saxton, Shure, Telex, Tempo, Ten-Tec, Tokyo Hi Power, Trionyx TUBES, W2AU, Waber, Wilson, Yaesu Ham and Commercial Radios, Vocom, Vibroplex, Curtis, Tri-Ex, Wacom Duplexers, Repeaters, Phelps Dodge, Fanon Intercoms, Scanners, Crystals, Radio Publications.

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS
HAM DEALER INQUIRES INVITED PHONE IN YOUR ORDER & BE REIMBURSED
COMMERCIAL RADIOS stocked & serviced on premises.
Amateur Radio Courses Given On Our Premises, Call
Export Orders Shipped Immediately. TELEX 12-7670

ALL SALES FINAL

CIRCLE 41 ON READER SERVICE CARD

Number 13 on your Feedback card

Antennas In The Spring

An Ounce of Prevention . . .

by Bill Clarke WA4BLC

Ah, warm weather at last! It brings the urge to return to the great outdoors, to smell the fresh air and watch nature bud forth. It's also time to repair all the damage winter has wrought upon exterior amateur radio appliances such as antennas, feed-lines, and grounds.

Don't be Listless

Here's a handy list of things to do in the spring to assure the structural integrity and safety of antenna installations:

1. Examine all coax feed-lines, specifically looking for chafed, ripped, torn, or broken insulation. Replace any lines that aren't *perfect*. Openings in the outer insulation of coax cable allows moisture to enter. Moisture causes a degradation in the cable, better known as loss. These losses are more apparent at VHF frequencies than HF. Time does not heal damaged coax, and the losses will only get worse with age.

2. Check all coax connectors for tightness. Jack Frost apparently carries a pair of pliers with him and loosens coax connectors during the winter. Tighten each one, then apply a weather sealer to prevent moisture from entering the cables. The sealer shouldbe a high-grade silicon caulk, butyl rubber caulk, or one of the coax sealer products sold at ham radio stores.

3. Fasten all coax cable runs to solid support (tower legs, stand-offs, etc.). Using cable ties or tape, secure feed-lines tokeep them from moving. This reduces the chances of damage.

4. Look at all connections both in and out of the shack. Grounds work themselves loose over a period of time. Loose grounds can greatly interfere with reception, transmission, and signal patterns, in addition to increasing the electrical hazard. Check the ground conductors themselves. The aluminium wire often used for exterior lightning grounds sometimes breaks, leaving an antenna ground return running through the shack. Replace any questionable ground runs with copper wire and follow this golden rule: NO SPLICES!

5. Check all the tower hardware for tightness, including the guy line system. Jack visits there, too!

6. Replace rope halyards on wire antennas each spring. The sun's ultraviolet rays deteriorate most synthetic ropes in a year's time. Many hams wait until the ropes rot in two and fall to a handy working location on the ground. There are a few new rope products on the market that last for several years. Contact a marine store for more information on them.

". . . follow this golden rule: NO SPLICES!"

7. Make sure wire antennas are secure and unreachable from ground level. Kids have a penchant for pulling on anything they can reach. Having a kid hanging onto the end of an antenna makes tune-up very difficult and is a little rough on the kid's fingers. Make this check and minimize the chances of a law-suit!

8. Make the tower inaccessible to local children! Towers are magnets for thrill-seeking kids. Fence in its base or, at the very least, place climb-resistant panels on the lower section.

9. Check the mobile installation. Check the weather tightness of the mount base, antenna attachment to the mount. Make sure coax connections are solid. Check and clean battery cables, then check the power cables going to the mobile rig.

Those are the basics! Here are a few extra tips:

- Galvanized electric fence wire works well for making wire antennas. It is also very CHEAP.
- Melt the ends of plastic/poly ropes to prevent unraveling.
- Place a few drops of contact glue on all rope knots. This will remind them to stay tied.
- Links of plastic decorator chain make fine antenna-end insulators. Use several (like a chain) for high power.
- Use drip loops on all feed and control lines at the entry point to a building. This helps to keep moisture out of the walls and window frames.
- Don't try to improve on 1.3:1 or less SWR. That level is quite acceptable. It's often more hassle than it's worth to try to lower it.
- Electrical service ground rods are better, and CHEAPER, than those sold at most radio supply stores. Be aware of the local galvanized ⅝" diameter rods that meet the local electrical codes.
- A steel fence post-driver pounds an 8' ground rod into the ground in about five minutes. Without working up a sweat.
- Use only stainless steel hardware on tower installations. It doesn't rust and is easily dismantled years later.

The most important tip for all:

IF IT AIN'T BROKE, DON'T FIX IT!

Now for a summer full of radio fun. No worries about anything falling down from the ravages of winter. Huh, what? Who said anything about cleaning the gutters and painting the house?

Bill WA4BLC is a frequent contributor to our pages. He has written several books and many articles on radio communications and aviation. His address is PO Box 2403, Falls Church, VA 22042.

Number 14 on your Feedback card

Tonna F9FT 20804
4-element 144 MHz yagi
Price Class: $45

Cushcraft 124WB
4-element 144 MHz yagi
Price Class: $58

CUSHCRAFT 124WB and Tonna 20804 4-Element 144 MHz Broadband Yagis

Two excellent choices for small yagis.

The real work-horse antennas on 2 meters these days are the 4-element broadband yagi. They're everywhere: In repeater service, atop a tower, stacked in pairs, at a portable communications site, backpacked up a mountain, even on a boat. The 4-element yagi represents the next logical step up for many 2m operators, such as the FM operator trying to make that distant repeater...the SSB maven trying some portable operation from the car...and the ragchewer who needs a simple gain antenna at his camp or cabin.

Varieties of this design abound, but this review will examine two prime examples, the American-made Cushcraft 124WB Boomer and the French-made Tonna 20804 yagis. Both are lightweight antennas that go together in no time at all. They employ universal end mounting for vertical or horizontal polarization. The antennas are designed to cover the frequency range of 144-148 MHz with no retuning, and they sell for under $60.

Some Differences

Figure 1 shows both antennas side-by-side. Notice the difference in boom lengths. The Cushcraft checks in at 48″ while the Tonna measures 37″. Allowing clearance for the boom-to-mast brackets, the Cushcraft measures 40″ from reflector to driven element #2 while the Tonna has 31″ over the same span. These numbers translate into .5 and .38 wavelengths respectively. From these numbers, both antennas should have fairly broad patterns with the Tonna slightly broader.

And they do. Cushcraft specifies the E (vertical) plane 3 dB beamwidth to be 60 degrees and the H (horizontal) plane to be 83 degrees. Tonna claims the E plane to be 58.6 degrees and the H plane to be 86.4 degrees. The latter is somewhat broader than the Cushcraft due to the shorter boom length. However, the numbers are very close—close enough to be called even. And as far as gain goes, Cushcraft claims 10.2 dBd (over a dipole radiator) and Tonna specifies 8.9 dBi (over an isotropic radiator). Two different rating systems are in use here, but I would assume that the real numbers aren't much different between the two.

Construction

Both antennas are extremely easy to assemble. It took all of 10 minutes to put the Tonna together, and the Cushcraft about 15. The difference in time can be attributed to the driven element assemblies—Tonna's is completely encapsulated and ready to attach with one screw. Cushcraft's requires the assembling and fastening of the two T-match sections to the driven elements. Both kits contained all of the hardware needed for the job, and both use stainless steel fasteners everywhere. Even the boom to mast clamp on the Cushcraft is completely stainless, a big improvement from past clamps. Tonna uses a galvanized clamp, which has resisted rust so far on my other Tonna yagis.

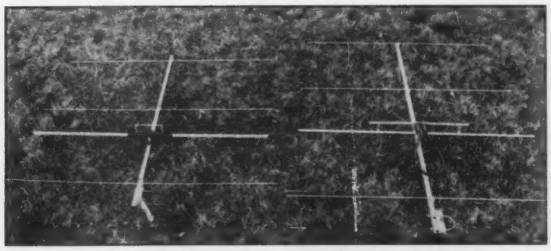
The Tonna parasitic elements each consist of a piece of aluminum rod with two dimples on it. The first centers the element in the stainless bracket. The second prevents it from sliding out of the bracket during shipping. Each bracket is attached with a wing nut—no wrenches needed. This makes for a portable antenna design since the elements can be folded back against the boom for transportation, with the driven element carried seperately.

The Cushcraft parasitic elements are also aluminum rod fitted to a drilled bushing. Reinforced aluminum brackets go on either side of the drilled hole to prevent denting the bushing and to hold it securely to the boom—a tried and true method used on all Cushcraft Boomers. A nutdriver is used to attach all of the elements. The Cushcraft can also be broken down for portable use, though not as easily as the Tonna. The procedure is quick, and the driven element can be attached as one piece.

As stated earlier, the Cushcraft employs the classic T-match which assures broadband characteristics at 2 meters. The Tonna match is a bit harder to see as it is encapsulated; however, Tonna also calls their design a T-match. The casing is hard black plastic for weatherproofing and no balun is employed. The larger Tonna beams use a ¼ wave decoupling sleeve. The feedpoint impedance is 50 ohms. Cushcraft does employ a coaxial balun

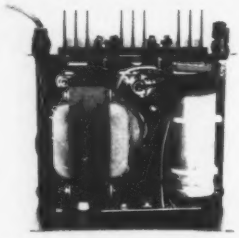
Four-Element Yagi Comparisons

Specification	124WB	20804
Gain (Manufacturer's claim)	10.2 dBd	8.9 dBi
F/B ratio (claimed)	19 dB	16 dB
(measured)	17 dB	15 dB
Sidelobe Rejection (claimed)	n/a	–13 dB
(measured)	–14 dB	–13 dB
VSWR bandwidth (claimed)	5 MHz @ 1.5:1	4 MHz @ 1.4:1
(measured)	4 MHz @ 1.2:1	4 MHz @ 1.2:1
Overall length	48″	37″
Weight	3 lbs	2.2 lbs



The Tonna (left) and Cushcraft (right) 4-element 144MHz yagis.

ASTRON CORPORATION
9 Autry
Irvine, CA 92718
(714) 458-7277



INSIDE VIEW — RS-12A

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models **except RS-3A, RS-4A, RS-5A.**
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- **Also available with 220 VAC input voltage**

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM SERIES

MODEL RM-35M

19″ × 5¼ RACK MOUNT POWER SUPPLIES

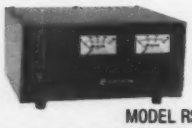
MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A	2.5	3	3 × 4¾ × 5¾	4
RS-4A	3	4	3¾ × 6½ × 9	5
RS-5A	4	5	3½ × 6⅛ × 7¼	7
RS-7A	5	7	3¾ × 6½ × 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 × 7½ × 10¾	11
RS-12A	9	12	4½ × 8 × 9	13
RS-12B	9	12	4 × 7½ × 10¾	13
RS-20A	16	20	5 × 9 × 10½	18
RS-35A	25	35	5 × 11 × 11	27
RS-50A	37	50	6 × 13¾ × 11	46

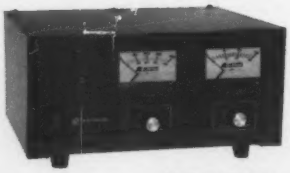
RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES



MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	5	7	4 × 7½ × 10¾	10
RS-10S	7.5	10	4 × 7½ × 10¾	12
RS-12S	9	12	4½ × 8 × 9	13
RS-20S	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

made from RG-11/U and also specifies a 50 ohm feedpoint impedance.

Performance

The test range was configured using a KLM "wet noodle" dipole driven element (the remainder of a KLM 4-element yagi that died on a DXpedition) atop a collapsible mast. 200 milliwatts of power at 2 meters were connected to this "quasi-tropic" radiator for the express purposes of measuring the front-to-back ratio and the sidelobe rejection of both 4-element yagis. I didn't bother to measure for gain, since it would have been difficult to substantiate. See Table 1 for the results.

No surprises here. Both antennas have about the expected sidelobe patterns for the number of elements and wavelength. Matching was excellent on both yagis. Setting the 124WB match to the factory suggested points required no further tuning. The Tonna, of course, is pretuned and cannot be adjusted.

Conclusion

Both the Cushcraft 124WB and Tonna 20804 are excellent choices for small yagis. These antennas are easy to build, use solid materials and work right out of the box. Neither one weighs much and could be installed practically anywhere—on a mast, tower, house, tree, flagpole. In short, they are versatile antennas for weak signal work, FM simplex and repeater operation, and packet stations. 73

73 Book Review

Number 15 on your Feedback card

Transmitter Hunting

The RDFer's Bible

Transmitter Hunting: Radio Direction Finding Simplified
by Joseph D. Moell and Thomas N. Curlee
TAB Books
PO Box 40
Blue Ridge Summit PA 17214
Price: $18

reviewed by Phil Nowak KA9KAF

This book is for foxhunters—those who hunt hidden transmitters for sport—whose technique makes everyone else look good. For those who are tired of searching through thirty years of DFing articles in an attempt to improve their skill, I highly recommend *Transmitter Hunting* by KØOV and WB6UZZ.

Basics of Fox-Hunting

It's an enthralling read, even for non-hams. The authors did an outstanding job in both comprehensive coverage of the subject and easy-to-read writing style. They start off simply to get the reader's attention and save the more technical and esoteric items for later.

There are two fundamental needs for transmitter hunting. The first is a means of telling the direction from which the signal is coming, and the second is some indication of signal strength. The authors, after a brief historical introduction, dive right into directional antennas. The reader discovers just how simple and inexpensive it is to build and use some of these antennas. For those with larger budgets, the authors cover more expensive and elaborate systems. Chapters two through four cover these antennas and show how to get started.

In chapter five, the readers get to the second fundamental and signal strength. As any foxhunter knows, the S-meter on most radios leaves something to be desired. This chapter is a gold mine of information on this subject. I personally favor the LED S-meter, because they are easy to read on night foxhunts.

Page 48 starts the discussion of extended LED meters. Page 50 has a schematic of how to build one. Chapter six thoroughly discusses attenuation. This is very important since most radios overload and lose their directionality when the hunter gets too close to the RF source.

Search and Rescue

The authors devote an entire chapter on equipping a vehicle for fox hunting. A number of specialized DF units are discussed. They clearly and skillfully explain Doppler DFs and the Little L-Per.

While most regard transmitter hunting as a sport, it has its serious side in the area of search and rescue. Chapter ten covers this topic. The authors discuss the various organizations involved in search and rescue. I can attest as a communications officer in the Civil Air Patrol that the techniques and skills are the same whether the payoff is saving lives or sitting around the munchies spot after a good hunt.

Questions came to mind such as, "Do they cover the subject of hunting on foot?," or "What about using computers to help?," while reading some of the earlier chapters. A resounding *yes* to both of these questions. The authors even cover using satellites for DF.

Toward the end of the book, the authors cover some of the more esoteric and expensive means of DFing. Some hams may remember seeing an OAR (Ocean Applied Research) unit at the Dayton hamvention a couple of years ago. The unit is fascinating, but its $20,000 tag, plus another eighteen hundred dollars for the antenna, daunts all but the most committed. The reader can read all about it, however, in chapter 19. This chapter also outlines the time-difference-of-arrival method.

There is a nice list of manufacturers and organizations in the appendix, and a very good bibliography.

Updates

There are a few errata and updates. Figure 12-7 on page 170 has S1 and S3 reversed in the schematic. The -94 at the bottom should be -9V. On page 313, the entry for A&A Engineering has changed. They are now at 2521 W. La Palma, Unit K, Anaheim CA 92801, (714) 952-2114. The Dick Smith DF unit is now sold by American Electronics, Box 301, Greenwood IN 46142, (317) 888-7265. The authors found some problems in the Dick Smith Doppler unit. See the July 1987 issue of *Ham Radio* for their changes to that unit. They received this information too late for publication in this edition.

This is an excellent book, well written, logically organized, and inexpensive. Anyone interested in radio direction finding should track down this book. 73

Foxhunters Unite!

Europeans have traditionally had numerous and very active fox hunting groups. Hidden transmitter hunting and radio orienteering are big-time sports overseas. Each year the teams from Eastern and Western Europe, Australia, Japan, and many other countries participate in the Radio Direction Finding (RDF) World Championships.

Surprisingly, these activities have had little support in North America. Although there are a number of clubs in California, the Midwest, and New York, most fox hunters are scattered few and far between.

73 Magazine would like to hear from clubs and individuals interested in organizing RDF sports on a national level. Regional and national RDF competitions in this country would ultimately yield a US National RDF Team to compete in the World Championships held in Europe each year.

Send your ideas to *73 Magazine, RDF Ideas, WGE Center, Peterborough, NH 03458.*

73 Review

by Bill Clarke WA4BLC

Model DF Package

Datong Electronics Ltd. of Leeds, England
Units sold by Electronic Equipment Bank
516 Mill Street NE
Vienna, VA 22180
Price Class: $329

There is a passion for hunting something deeply implanted in the human breast. (Charles Dickens)

VHF radio direction finding (DFing) has always been a problem for the ham. Equipment was cumbersome and often hard to get. Datong's DF package changes this.

Datong is an electronics manufacturing firm based in Leeds, England, that designs and produces specialized radio communications devices. Hams may find many of their products useful. Among these is the Model DF, a doppler-based direction finder.

The DF is a complete direction finding system that works with an FM narrow band receiver to determine an RF source location. It's not necessary to modify the receiver to use this system. Hams can use it for many purposes, including tracking and finding jammers, and fox hunting.

Take a Look

The DF display unit is the black box that controls the system and shows the results. Three controls, two switches, and 18 LEDs are on the front panel. The 16 LEDs in a circle indicate the direction of the sought-after signal.

In addition to the display unit, there are the antenna combiner and four antennas. The combiner, model DFA1 or DFA2, is the second part of the Model DF package. It is weatherproof for outdoor installation. The DFA1 and DFA2 are identical except for a magnetic mount installed on the DFA2. The user has to supply the antennas.

Installation

Connect the assortment of plug-in cables between the components:

—Connect the display unit RF output to the receiver's antenna connector

—Apply 11–15 VDC to the back of the display unit connect the audio output from the receiver to the display unit and connect an external speaker

—Connect a rubber duck to the display unit for communications purposes (up to 20 watts RF may be transmitted through the system)

—Connect the coax line from the antenna combiner to the display unit

—Connect four antennas to the antenna combiner

The initial installation involves attaching the feedlines from the four antennas to the combiner box, which may take a half hour to do. It's only a one-time procedure, however. The antennas are permanently connected to the combiner box.

Coax installation takes a little grace. Each line terminates in a screw connector block. The easiest way to make coax connections to these blocks is by dressing the shield and center connectors very short, twisted, and soldered on the ends. These ends compress very nicely in the screw blocks. BNC connectors installed on the combiner would be easier for the user.

The only other fault was the dime-store power connector supplied with the DF unit. It's a typical round portable power plug like those found on many wall chargers. Not easy to solder and very low-quality.

The installer can carry out the initial test and calibration with a transmitter at a known location. A nearby repeater may prove handy for calibration. The process only takes two minutes. This gadget is really simple to use!

Photo A. The DF display unit. Note the circle of 16 LEDs on the front panel at left. Each represents 22.5 degrees of azimuth.

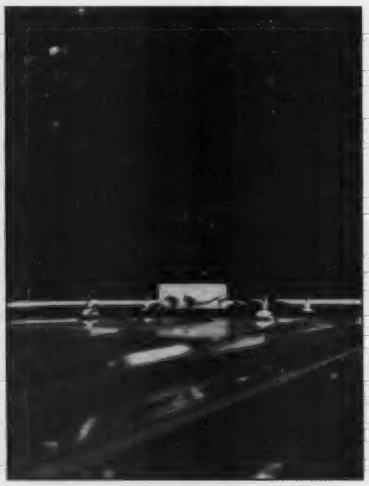


Photo B. Four mag-mount 2-meter antennas and the combiner on the van roof.

On the Road

I tested the unit in both fixed and mobile installations. The ICOM 2AT, ICOM 02-AT, Kenwood 7950, and ICOM R7000 were the test receivers for this evaluation. The Hustler VHF mag-mounts sat in the corners of a 12" square. I placed four mag-mounted ¼-wave two-meter antennas in a square on a piece of sheet metal, which sits on the car roof. This got the antennas into the clear.

Mobile operation was

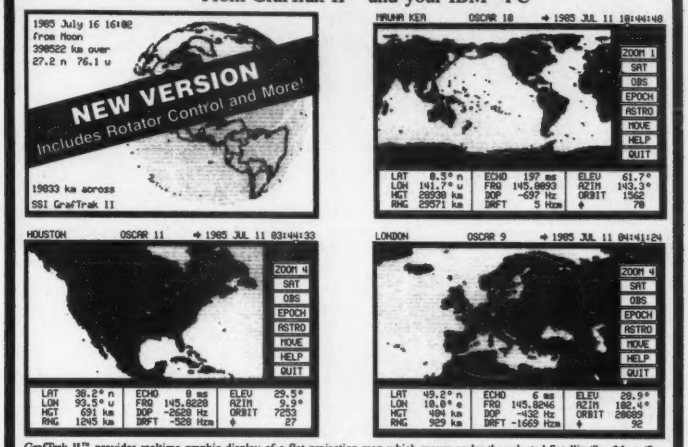
CB-TO-TEN

73 has led the way on CB-to-10 meter conversions. Take advantage of our offer to help you get on 10 meters before the sunspots peak again. It's easy and saves you money!

#	Title	Issue
1	Bandplan and Crystal Info	May 77
2	Conversion Data	May 77
3	Radio Shack TRC-47	Jul 77
4	E.F. Johnson Messenger 123A	Jul 77
5	Hy-Gain 670B	Jul 77
6	Antenna Suggestions	Dec 77
7	Radio Shack Realistic TRC-II	Dec 77
8	The Publicom I	Feb 78
9	How about SSB Conversions?	Jul 78
10	Radio Shack TRC-11 and TRC-74	Aug 78
11	Radio Shack Realistic Mini 23	Sep 78
12	Hy-Range 681A (Hy-Gain)	Sep 78
13	Kraco KCB-2310B	Oct 78
14	Lafayette Telsat SSB-75	Nov 78
15	Radio Shack Realistic TRC-452	Nov 78
16	CB Walkie-Talkie Conversion	Nov 78
17	Sharp Model CB-800A	Jan 79
18	SBE Sidebander III and Pace 123A	Jan 79
19	Midland 13-882C and Other PLL Rigs	May 79
20	Lafayette SSB-75 and SSB-100	Jun 79
21	Royce I-655	Nov 79
22	Johnson Viking 352	Nov 79
23	CB to 10 FM - Part I	Jan 80
24	CB to 10 FM - Part II	Feb 80
25	More Talk Power for the TRC-11	Mar 80
26	Sears RoadTalker 40	Mar 80
27	Penney's SSB Rig	Apr 80
28	The Poly-Paks 40-Channel CB Board	Jun 80
29	The Cobra 132	Jul 80
30	New Life for SSB CB Rigs	Jul 80
31	Double Your Channels in SSB Conversions	Jul 80
32	On Ten FM	Aug 80
33	Put That Hy-Gain CB Board to Use	Sep 80
34	Peaking and Tweaking Hy-Gain Boards	Mar 82
35	CB to CW? (Hy-Gain)	Jul 82
36	Maximum Modulation for CB Conversions	Dec 82
37	Beef Up Your CB-to-CW Conversion	Feb 83
38	Add a Digital Readout to Your CB Conversion	Feb 83

Send $3.00 for the first article and $1.50 each thereafter. Just choose the article numbers and call with a credit card number or send a check or money order to: *CB to Ten, 73 Amateur Radio Magazine, WGE Center, Peterborough NH 03458 (603-525-4201).*

GET A BIRD'S EYE VIEW
From GrafTrak II™ and your IBM® PC



GrafTrak II™ provides realtime graphic display of a flat projection map which moves under the selected Satellite/Sun/Moon/Star coverage circle and updates once per second. Spherical projection views and graphic screen dumps to an IBM/Epson/Oki printer can also be produced. Requires an IBM PC, PC/XT, PC/AT, or true compatible, an IBM Color/Graphics Monitor Adapter or true compatible, 8087 math coprocessor, minimum 256K RAM with 512K recommended, DOS 2.0 or later, and either two 360K floppy drives or one 360K floppy and one hard drive.

SILICON EPHEMERIS™ provides tabular data output to the screen, printer, or disk file for the following operating modes: 1 observer to 16 satellites, 16 observers to 1 satellite, schedule for 1 observer to 1 satellite, window between 2 observers and 1 satellite, rise and set times for 1 satellite, time ordered rise and set times for 16 satellites, Almanac for Sun and Moon, 16 observers to Sun/Moon, schedule for 1 observer to Moon, window between 2 observers and Moon, schedule for 1 observer to Sun. Requires either an IBM PC, PC/XT, PC/AT, or true compatible, and IBM Monochrome or IBM Color/Graphics Monitor Adapter or ture compatible, an optional 8087 math coprocessor, 256K RAM, DOS 2.0 or later, and one 360K floppy drive.

Each package includes SED, an editor program to construct and modify Satellite/Observer database files. These products can be run from a hard disk and are not copy protected.

GrafTrak II™ and SILICON EPHEMERIS™ are priced at $119.95 each or $199.95 for both. Texas residents add sales tax. Order by check, money order, MasterCard, or VISA.

Silicon Solutions, Inc. • P.O. Box 742546 • Houston, Texas 77274-2546 • (713) 777-3057

IBM is a registered trademark of IBM Corporation
GrafTrak II and Silicon Ephemeris are trademarks of Silicon Solutions, Inc.

very interesting. The impressive array of four antennas sat on the van roof, and the display unit rested on the dash panel. I calibrated the display to point to the front of the van.

The first DFing took place in a local shopping center on a hill. Parking lots located on hills offer good visibility to the eyes and to VHF DFing systems. From there, I got very accurate bearings on all the local repeaters, many mobiles on their inputs, and some simplex stations. I tried the system on various frequencies. It did very well for all FM applications from 20 to 220 MHz.

Although the 16-LED DF display indicates an area of 22.5 degrees, the actual working resolution is 11.25 degrees. This sounds like a large range for error, but when approaching the unknown transmitter, the span decreases in scope and loses importance.

After checking motionless operation, I drove away and followed the LEDs straight to the repeater site. The only problems during this mobile DF session were flutter, reflections, and shadowing caused by buildings and land contour.

Most VHFers are familiar with RF reflections. They cause multi-path and come from geographic features (hills, cliffs, etc.) and man-made objects (buildings, towers, and more). These reflections cause accuracy problems with any DFing system. The Datong Model DF is no exception. More important than reflections of the transmitted signal, however, is the location of the receiving antennas.

Receiving antennas located near reflective objects (other antennas, metal roofs, gutters, etc.) throw DFing accuracy way off. It's very important to place the receiving antenna system clear of surrounding obstacles. Mount the antennas as high as possible.

Tracking Tips

Topographic maps are useful, if not essential, because they show essential geographical details like elevation and contours. Both details are important when DFing radio signals that may be influenced (bent or reflected) by the "lay of the land." Other useful maps are the planimetric map, a linear information display of roads and other surface information, and the 7-½ minute map, a very detailed contour map.

Topographical maps (and other types) are available from:

USGS - NCIC
507 National Center
Reston, VA 22092
Phone: (703) 648-6045

Triangulation

Two DF stations several miles from each other can locate a transmitter by triangulation. Triangulation is easy. First, take an RF source bearing from two different DF station locations. Then, on the map, draw a line from each of the DF station locations along the bearing of the RF source. The intersection of the lines is the location of the RF source!

The Green Light

I recommend the DF system. It is useful, simple to operate, and relatively inexpensive. Repeater operators will find it very valuable for locating interference sources, identifying unknown repeater signals, and finding jammers. The fox hunters will revel in the ease of winning the hunt . . . until everyone gets one. 73

Bill WA4BLC regularly contributes to 73. He has written several books and many articles on aviation and radio communications. His address is PO Box 2403, Falls Church, VA, 22042.

Manufacturer's Specifications

Supply Voltage:	10–15 VDC
Supply Current:	400 mA maximum
Frequency Range:	20–200 MHz
Directional Accuracy: (after initial calibration)	± 5 degrees
Display:	16 green LEDs
Audio Power:	1.2 watts into 8Ω speaker
Dimensions:	
DF display	6.0 x 2.6 x 6.2 inches
DFA1 combiner	4.7 x 4.7 x 2.2 inches
DFA2 combiner	4.7 x 4.7 x 2.8 inches
Weight:	
DF display	18 ounces
DFA1 combiner	12 ounces
DFA2 combiner	25 ounces

HF Equipment	Regular	SALE
IC-761 HF xcvr/SW rcvr/ps/AT	2499.00	2149
HM-36 Scanning hand microphone	47.00	
SP-20 Ext. speaker w/audio filter	149.00	139.95
FL-101 250 Hz 1st IF CW filter	73.50	
FL-53A 250 Hz 2nd IF CW filter	115.00	109.95
FL-102 6 kHz AM filter	59.00	
EX-310 Voice synthesizer	59.00	

IC-751A 9-band xcvr/.1-30 MHz rcvr	1699.00	1449
PS-35 Internal power supply	219.00	199.95
FL-32A 500 Hz CW filter (1st IF)	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	109.95
FL-53A 250 Hz CW filter (2nd IF)	115.00	109.95
FL-33 AM filter	49.00	
FL-70 2.8 kHz wide SSB filter	59.00	
RC-10 External frequency controller	49.00	

IC-735 HF transceiver/SW rcvr/mic	999.00	869.95
PS-55 External power supply	219.00	199.95
AT-150 Automatic antenna tuner	445.00	389.95
FL-32A 500 Hz CW filter	69.00	
EX-243 Electronic keyer unit	64.50	
UT-30 Tone encoder	18.50	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	1699
PS-15 20A external power supply	175.00	159.95
PS-30 Systems p/s w/cord, 6-pin plug	319.00	289.95
MB Mobile mount, 735/751A/761A	25.99	
SP-3 External speaker	65.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal for 751A	79.00	
PP-1 Speaker/patch	179.00	164.95
SM-6 Desk microphone	47.95	
SM-8 Desk mic - two cables, Scan	89.00	
SM-10 Compressor/graph EQ, 8 pin mic	149.00	139.95
AT-100 100W 8-band auto. antenna tuner	445.00	389.95
AT-500 500W 9-band auto. antenna tuner	589.00	519.95
AH-2 8-band tuner w/mount & whip	659.00	589.95
AH-2A Antenna tuner system, only	519.00	449.95
GC-5 World clock	91.95	89.95

VHF/UHF base multi-modes	Regular	SALE
IC-275A 25W 2m FM/SSB/CW w/ps	1235.00	1079
IC-275H 100W 2m FM/SSB/CW	1389.00	1229
IC-375A 25W 220 FM/SSB/CW	1399.00	1249
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	1249
IC-475H 75W 440 FM/SSB/CW	1599.00	1429
IC-575A 25W 6/10m xcvr w/ps	1399.00	1249

ICOM

IC-471A* 25W 430-450	CLOSEOUT	979.00 749.95
PS-25 Internal power supply		125.00 114.95
AG-1* Mast mounted preamplifier		99.50
IC-471H* 75W 430-450	CLOSEOUT	1399.00 989.95
PS-35 Internal power supply		219.00 199.95
AG-35* Mast mounted preamplifier		99.75

***Preamp $9.95 with 471A or 471H Purchase**

Accessories common to 271A/H and 471A/H		
SM-6 Desk microphone		47.95
EX-310 Voice synthesizer		59.00
TS-32 CommSpec encode/decoder		59.95
UT-15 Encoder/decoder interface		33.95
UT-15S UT-15S w/TS-32 installed		96.00

VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM	CLOSEOUT	639.00 549.95
IC-490A 10W 430-440	CLOSEOUT	699.00 399.95

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00	379.95
IC-27H Compact 45W 2m FM w/TTP mic	459.00	399.95
IC-37A Compact 25W 220 FM, TTP mic	499.00	439.95
IC-47A Compact 25W 440 FM, TTP mic	549.00	489.95
PS-45 Compact 8A power supply	145.00	134.95
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, TTP mic	469.00	409.95
IC-28H 45W 2m FM, TTP mic	499.00	439.95
IC-38A 25W 220 FM, TTP mic	489.00	429.95
IC-48A 25W 440-450 FM, TTP mic	509.00	449.95
HM-14 Extra TTP microphone	59.00	
UT-28 Digital code squelch	39.50	
UT-29 Tone squelch decoder	46.00	
HM-16 Speaker/microphone	34.00	
IC-900A Transceiver controller	589.00	529.95
UX-29A 2m 25W unit	295.00	269.95
UX-29H 2m 45W unit	339.00	309.95
UX-39A 220MHz 25W unit	349.00	319.95
UX-49A 440MHz 25W unit	339.00	309.95
UX-59A 6m 10W unit	339.00	309.95
IC-3200A 25W 2m/440 FM w/TTP	649.00	579.95
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	39.00	
AHB-32 Trunk-lip mount	35.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	22.00	
Larsen PO-MM Magnetic mount	22.00	
IC-1200A 10W 1.2GHz FM Mobile	699.00	629.95
IC-1271A 10W 1.2GHz SSB/CW Base	1269.00	1129
AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	125.00	114.95
EX-310 Voice synthesizer	59.00	
TV-1200 ATV interface unit	139.00	129.95
UT-15S CTCSS encoder/decoder	96.00	
RP-1210 1.2GHz 10W 99 ch xcvr	1529.00	1349
RP-2210 220MHz 25W repeater	1499.00	1329
RP-3010 440MHz 10W FM repeater	1299.00	1149

MasterCard VISA

Hand-helds	Regular	SALE
IC-2A 2-meters	289.00	259.95
IC-2AT with TTP	319.00	279.95
IC-3AT 220 MHz, TTP	349.00	299.95
IC-4AT 440 MHz, TTP	349.00	299.95
IC-02AT/High Power	409.00	349.95
IC-03AT for 220 MHz	449.00	389.95
IC-04AT for 440 MHz	449.00	389.95
IC-u2AT with TTP	329.00	289.95
IC-u4AT 440 MHz, TTP	369.00	329.95

Accessories for micros - CALL $

IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	473.00	419.95
A-2 5W PEP synth. aircraft HT	499.00	449.95
A-20 Synth. aircraft HT w/VOR	599.00	529.95

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	79.00
BP-8 800mah/8.4V Nicad Pak - use BC-35	79.00
BC-35 Drop in desk charger for all batteries	79.00
BC-16U Wall charger for BP7/BP8	21.25
LC-11 Vinyl case for DIx using BP-3	20.50
LC-14 Vinyl case for DIx using BP-7/8	20.50
LC-02AT Leather case for DIx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	49.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	39.50
BP-4 Alkaline battery case	16.00
BP-5 425mah/10.8V Nicad Pak - use BC35	65.00
CA-5 5/8-wave telescoping 2m antenna	19.95
FA-2 Extra 2m flexible antenna	12.00
CP-1 Cig. lighter plug/cord for BP3 or DIx	13.50
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	24.50
MB-16D Mobile mtg. bkt for all HTs	25.99
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	34.95
HH-SS Handheld shoulder strap	16.95
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	24.50
HS-1uSA Vox unit for HS-10 & Deluxe only	24.50
HS-10SB PTT unit for HS-10	24.50
ML-1 2m 2.3w in/10w out amplifier	SALE 99.95
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver	$979.00	849.95
RC-11 Infrared remote controller	70.99	
FL-32A 500 Hz CW filter	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-44A SSB filter (2nd IF)	178.00	159.95
EX-257 FM unit	49.00	
EX-310 Voice synthesizer	59.00	
CR-64 High stability oscillator xtal	79.00	
SP-3 External speaker	65.00	
CK-70 (EX-299) 12V DC option	12.99	
MB-12 Mobile mount	25.99	
R-7000 25MHz to 2GHz scan rcvr	1139.00	999.95
RC-12 Infrared remote controller	70.99	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit	139.00	129.95
AH-7000 Radiating antenna	99.00	(8)

HOURS • Mon. thru Fri. 9-5:30; Sat. 9-3

Milwaukee **WATS** line: **1-800-558-0411** answered evenings until 8:00 pm Monday thru Thursday. **WATS lines are for Quotes & Ordering only, use Regular line for other Info & Service dept.**

All Prices in this list are subject to change without notice.

Order Toll Free: 1-800-558-0411

In Wisconsin (outside Milwaukee Metro Area) 1-800-242-5195

AMATEUR ELECTRONIC SUPPLY® Inc.

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 • Phone (414) 442-4200

AES® BRANCH STORES — Associate Store

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
Ohio WATS 1-800-362-0290
Outside Ohio 1-800-321-3594

ORLANDO, Fla. 32803
621 Commonwealth Ave.
Phone (305) 894-3238
Fla. WATS 1-800-432-9424
Outside Florida 1-800-327-1917

CLEARWATER, Fla. 34625
1898 Drew Street
Phone (813) 461-4267
No In-State WATS
No Nationwide WATS

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
No In-State WATS
Outside Nevada 1-800-634-6227

CHICAGO, Illinois 60630
ERICKSON COMMUNICATIONS
5456 N. Milwaukee Avenue
Phone (312) 631-5181
15 min. from O'Hare!

▲ ▲ ▲ ▲ ▲ ▲

The Next Phase in Packet Radio
Is Just Over the Horizon

▲

CIRCLE 239 ON READER SERVICE CARD

1988 CHARLOTTE HAMFEST AND COMPUTERFAIR

ARRL SANCTIONED HAMFEST
SAT. MARCH 19, 9:00 AM to 5:00 PM — SUN. MARCH 20, 9:00 AM to 3:00 PM
CHARLOTTE CONVENTION CENTER, 4th & COLLEGE STREETS, CHARLOTTE, NC
87,000 SQUARE FEET INDOORS, 500 FLEA MARKET TABLES, 160 EXHIBIT BOOTHS

AWARDS • EXAMS • FORUMS • LADIES ACTIVITIES
LICENSE EXAMS BY CHARLOTTE VEC • EXAMS ON SUNDAY ONLY
Completed Form 610 + $4.50 + Photo Copy of License & Certificates
Required by March 12, 1988 — **NO WALK-INS**
Mail to: CHARLOTTE VEC, 227 Bennett Lane, Charlotte, NC 28213

SPECIAL FLEA MARKET AREA WITH ELECTRICITY
5 TABLE MINIMUM — By advanced reservation only — NC Sales Tax Collected
Special Area reservations must be in by March 1, 1988

ADMISSION STILL AT 1983 PRICES!
PRE-REGISTRATION TICKETS: **$5.00** AT-THE-DOOR TICKETS: **$6.00**
Flea Market Tables (6 ft.) — Pre-registration $10.00 — At the door $12.00
Tickets and Flea Market Tables valid for both days!
PRE-REG DEADLINE March 11, 1988 — MAIL REQUESTS + S.A.S.E. and CHECK TO:

CHARLOTTE HAMFEST, P.O. BOX 221136, CHARLOTTE, NC 28222-1136
TALK-IN FREQUENCY — 145.29 MHz — W4BFB
EXHIBIT BOOTH: Robert Starling, N4GVF, 7921 Holly Hill Rd., Charlotte, NC 28212, (704) 568-7611
FLEA MARKET CHMN: Jeff Blythe, KA4WYC, 634 Northway Drive, Charlotte, NC 28208, (704) 393-7140
PRE-REGISTRATION: Andy Hawkins, G4GKK, 426 Greystone Road, Charlotte, NC 28209, (704) 523-4463

CIRCLE 301 ON READER SERVICE CARD

73 Review *by Arliss Thompson W7XU*

Maxcom Automatic Antenna Matchers

Maxcom, Inc.
1309 S.W. 5th Ct.
Ft. Lauderdale FL 33312.
Price Class: 200D $599
XLD-150 $299

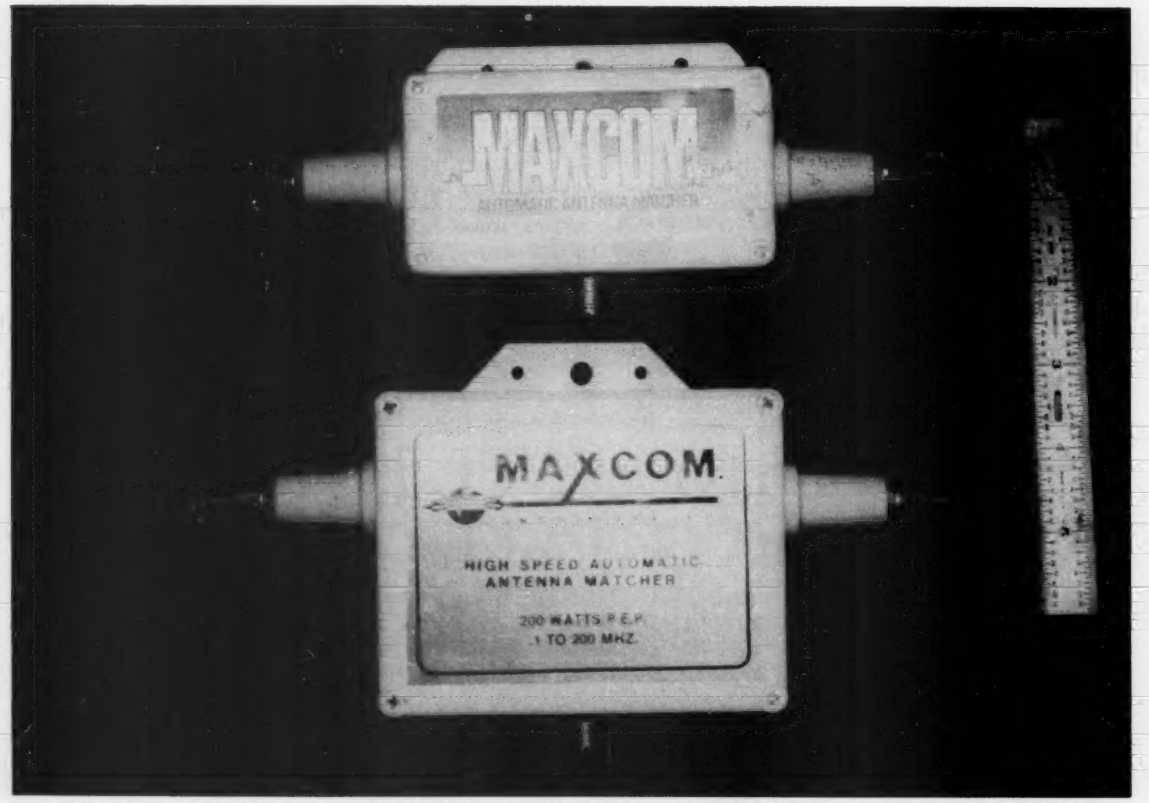


Photo A. Maxcom 200D (bottom) and XLD-150 (top).

You've seen the ads: "One antenna 100 kHz to 200 MHz. . . absolutely no tuning. . . VSWR 1.5:1 or less." Perhaps you've seen the reviews that have appeared elsewhere, which have ranged from the critical (Hall's "Product Review," November 1984 *QST*) to the enthusiastic (Gordon West's "Maritime Mobile" column, December 1983 *Worldradio)*.

"So which is it?" you might ask. "Do the Maxcom units work or is someone trying to pull the wool over our eyes?" Given Maxcom's controversial history, I jumped at the chance to test two of their models for *73*.

The 200D and the XLD-150

I received the 200D (Maxcom's most popular) and the XLD-150 models for testing. The manufacturer's literature claims:

- high efficiency with instant matching over the specified frequency range;
- no moving parts; and
- no control leads.

Maxcom markets the 200D as a commercial model with a power rating of 200 watts in SSB service (derate 75% for continuous duty) that covers 0.1 to 200 MHz. The XLD-150, on the other hand, is a "utility" model designed for 1.5 to 30 MHz with a power handling capability of 150 watts, SSB only. The XLD-150 is smaller than its commercial cousin, and at 1.2 lbs is also a pound lighter. Both units take 50Ω coaxial feedlines and support a variety of installation configurations. The 200D carries a 5-year warranty, and Maxcom guarantees the XLD-150 for one year.

The Maxcom units initially impressed me as well made devices. Each is housed in a stout aluminum box finished in white enamel. SO-239 connectors accept the feedline, and the antenna legs attach to two ceramic insulators The XLD-150 measures 3¼ x 9¾ x 1½ inches, while the 200D measures 4¾ x 10 x 2¼ inches.

You Can't Come In

I normally investigate the inner workings of an electronic device for review. I wanted to do the same with these tuners, but they are filled with epoxy. Removal of the epoxy could only damage the units. Unrelenting curiosity and X-ray equipment at my disposal, however, produced the pictures shown in the review.

ALL BAND ANTENNAS

ALL BAND DIPOLE

- Only 135 feet overall length
- Perfect match for your Antenna Tuner with balanced line output
- Handles Full Power
- Works with all transmitters, tranceivers, receivers, etc.
- Completely Factory assembled—Ready to Install—NO adjustments necessary
- INCLUDES 100 feet of 450Ω Feedline
- Feedline can be shortened
- Works ALL Bands 160 thru 10 Meters
- Perfect for ALL classes of Amateurs
- Install as Flat-top, Sloper, Inverted "V", or almost any configuration
- Provides excellent SWR on all bands
- Utilizes Heavy 14 guage stranded CopperClad (CopperWeld) antenna wire, (30% copper; 70% high-strength steel) NO rust, Will not stretch like copper
- Instructions included

Model A-10 **$34.95** (U.S. Postpaid)

MULTI BAND TRAP ANTENNAS

TRAP DIPOLES

Model	Bands	Traps	Length	Price
D-42	10/15/20/40	2	55'	$64.95
D-52	10/15/20/40/80	2	105'	69.95
D-56	10/15/20/40/80	6	82'	114.95
D-68	10/15/20/40/80/160	8	146'	149.95

TRAP VERTICALS-"SLOPERS"-*

VS-41	10/15/20/40	1	28'	49.95
VS-52	10/15/20/40/80	2	49'	64.95
VS-53	10/15/20/40/80	3	42'	74.95
VS-64	10/15/20/40/80/160	4	73'**	94.95

*Can be used without radials
*Feedline can be buried if desired
*Permanent or Portable Use

ALL TRAP ANTENNAS are Ready to use - Factory assembled - Commercial Quality - Handle full power - Comes complete with: Deluxe Traps, Deluxe center connector, 14 ga Stranded CopperWeld ant. wire and End Insulators. Automatic Band Switching - Tuner usually never required - For all Transmitters, Receivers & Transceivers - For all class amateurs - One feedline works all bands - Instructions included - 10 day money back guarantee!

SINGLE BAND DIPOLES (Kit form):

Model	Band	Length	Price
D-10	10	16'	$17.95
D-15	15	22'	18.95
D-20	20	33'	19.95
D-40	40	66'	22.95
D-80	80/75	130'	25.95
D-160	160	260'	34.95

Includes assembly instructions, Deluxe center connector, 14ga Stranded CopperWeld Antenna wire and End insulators.

● **Any single band, or Trap antenna with "Pro-Balun" instead of Deluxe Center Connector; Add $8.00 to antenna price.**

COAX CABLE: (includes PL-259 connector on each end)

Type	Length	With antenna purchase	Seperately
RG-58	50'	$8.00	$11.95
RG-58	90'	12.00	16.95

DELUXE CENTER CONNECTOR

- NO RUST Brass Terminals
- NO Jumper Wires Used
- NO Soldering
- Built-in Lightning Arrestor
- With SO-239 Receptacle
- Handles Full Power
- Completely Sealed & Weatherproof
- Easy Element Adjustments
- Commercial Quality

CE-1 $8.95

"PRO-BALUN"

PB-1 $17.95

- 1:1 For Dipoles, Beams & Slopers
- Handles Full legal power
- Broadband 3 to 35 Mhz.
- Lightweight, Sealed & Weatherproof
- Deluxe connectors require NO soldering
- NO jumper wires
- Minimizes coax & harmonic radiation

DELUXE ANTENNA TRAPS:

1 1/4" Diameter

Completely Sealed & Weatherproof - Solid brass terminals - Handles Full Power - NO jumpers - NO Soldering. Instructions included. For 4-band Dipole Ant. 40/20/15/10 $36.00/pr. For 5-band Dipole Ant. 80/40/20/15/10 $38.00/pr.

SEE YOUR DEALER, OR ORDER DIRECT FROM FACTORY.
All orders shipped US Postpaid.
VISA / MC - give card #, Exp. date, Signature

SPI-RO MANUFACTURING, INC.
Dept 105, P.O. Box 1538
Hendersonville, NC 28793
Dealer Inquiries Invited

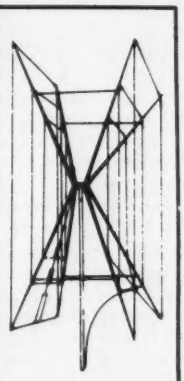
CIRCLE 134 ON READER SERVICE CARD

GEM QUAD PRODUCTS (1987) LTD.

Chosen By Amateurs For Over 15 Years.
Winner of the Manitoba Design Institute Award of Excellence.
Will Accommodate New Bands From 2 To 20 Meters.

Fiber Glass Quad Antenna For 10, 15, and 20 Meters

2 Element **$235.00**
3 Element **$399.00**
4 Element **$563.00**
Price is F.O.B. Boissevain.
Includes U.S. Customs Duty.
Kit Includes: Spider, Arms, Wire, Balun Kit and Boom Where Needed



Boissevain, Manitoba, Canada R0K 0E0
P.O. Box 291, Telephone (204) 534-6184

CIRCLE 308 ON READER SERVICE CARD

ORDER TOLL FREE (800) 426-2820

YAESU 767

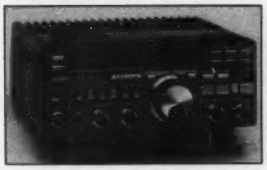
"SPECIAL PRICE" CALL NOW

YAESU 736

"SPECIAL PRICE" CALL NOW

YAESU 727R
$358.88
Dual Band
2m/70cm HT
5 Watts

YAESU 757GX II



"SPECIAL PRICE" CALL NOW

YAESU FT33RT
220 MHZ
"SPECIAL PRICE" CALL NOW

VISA

MasterCard

HAMTRONICS, INC

OVER 30 YEARS

4033 BROWNSVILLE ROAD
TREVOSE, PA 19047
(215) 357-1400 PA Residents & Service Info
Hours M,T,W—9-6 Th-F—9-8 Sat.—9-3
* Prices subject to change without notice *

Authorized Sales & Service—Yaesu ■ Kenwood ■ Icom

CIRCLE 309 ON READER SERVICE CARD

The 200D appears in the accompanying photographs identical to the 200-watt model that appeared in the 1984 *QST* review. Note the toroid and several other devices, which are almost certainly power resistors. Maxcom's reply ("Correspondence," June 1985 *QST*) to Hall's review indicated that the "ferrite transformer is connected directly to the SO-239 input." Further, "the resistors in the unit . . . are connected to the output of the transformer to create additional RF loading." That arrangement was likened to a "dummy dipole" by at least one writer (M. Slavin, "Technical Correspondence," April 1985 *QST*), but some letters of recommendation included with the units I received indicated that Maxcom has some satisfied customers, including the U.S. Army.

I resolved to remain neutral until I had my own results.

Starting Up

Maxcom's installation instructions consist largely of a listing of the features of their units. The instructions briefly describe dipole, inverted vee, and longwire installations. There are also a few simple illustrations provided. The instructions could be somewhat more detailed and explicit, especially for non-amateur users.

Maxcom recommends a minimum length of 35 feet per leg for a dipole. Fifty feet per side are preferred, especially on the lower HF bands. Changing the installation from a dipole configuration to that of an inverted vee, according to the directions, produces little or no effect on the SWR.

I erected the Maxcom and all comparison antennas in the inverted-vee configuration. The Maxcom units were used with one of two antennas: dipoles 70 and 128 feet long overall. All of the antennas tested had their centers 30 feet above ground, with the ends a minimum of 6 feet above ground. The antennas were mounted in the clear, with the receiving position located several hundred feet away. I made signal comparisons using an attenuation pad calibrated in 1 dB steps placed in line with the distant receiver's feedline. The test arrangement assured a constant level of input power to the tuner regardless of SWR. All SWR measurements reflect the actual SWR at the input to the antenna.

SWR Measurements

I first checked the SWR response of the Maxcom units using the 128' dipole. Measuring at 50 kHz intervals, the 200D showed a maximum SWR of 1.5:1 over all the US amateur bands from 3.5 to 29.7 MHz. This dipole actually resonated at the low end of the 80 meter band, but surprisingly the SWR was the highest on that band, ranging from 1.4:1 to 1.5:1 across that band. On the other bands the SWR never exceeded 1.3:1.

The XLD-150 did not perform as well in this situation, showing an SWR of up to 1.8:1 on 80 meters and as high as 1.6:1 at the upper end of the 10 meter band. Elsewhere the SWR was less than or equal to 1.4:1.

I next measured the SWR for the two Maxcom matching devices when used with the 70' dipole. With the 200D, the SWR on 80 meters dropped to a maximum of 1.2:1 on 80 meters, but was a flat 1.6:1 across the 40 meter band. It ranged from and from 1.7:1 to 1.8:1 on 15 meters, but elsewhere it met or surpassed the specified 1.5:1.

The XLD-150 also gave a low SWR on 80 meters with the short antenna, but again the SWR on 40 was relatively high (1.7:1). The 10 meter measurements were consistantly 1.8:1 across the band. Failure to correct the SWR measurements for feedline loss would have shown incorrect measurements better than 1.6:1 over the frequency bands tested, regardless of which antenna was used.

Signal Strength Comparison

Low SWR present at the transceiver output doesn't mean the antenna radiates well. Therefore, for the next phase of the review I compared signal strengths on various bands, with and without the Maxcoms in line. Using the 200D Maxcom, I found the received signal strength (measured as noted above) at opposite ends of the 80 meter band to differ by up to 4 dB when using the 128' antenna. I was concerned that something was amiss with my measuring technique, but a check of the same antenna with direct coax feed showed at most a 1 dB variation in received signal across the band. Repeating the measurements with the 200D confirmed the original results.

"The Maxcom units initially impressed me as well-made devices."

With the Maxcom at the feedpoint, signal strength gradually dropped by 4 dB as the frequency neared 3.5 MHz. The XLD showed a similar response over that frequency range. Signal strength measurements on the other bands demonstrated a more uniform response.

Antenna Gain

Now for the big question: How much signal strength gain (or loss) can a Maxcom antenna matcher provide when compared with the same antenna fed with coax? Again with the caveat that these tests were not done on an antenna range, here's what I found.

With the 128 foot inverted vee operating on 80 meters, the signal from the Maxcom was typically 9 to 10 dB down from the same antenna directly fed with coax. On 40 meters, this antenna acts as two half-waves in phase and has a theoretical gain of about 1.9 dB over a 40 meter dipole. When fed through the 200D, the signal from the long antenna was 2–3 dB down from a 40 meter dipole fed directly with coax. Allowing for the gain of the longer antenna, it appears the Maxcom is actually 4 to 5 dB weaker. Measurements using the 128' antenna on 10 MHz showed the Maxcom to be approximately 12 dB down. My experience shows that *resonant* dipoles outperform the Maxcom by at least 4 dB.

Other antenna arrangements will probably have different results.

Great for Some Applications

Are there any situations when the Maxcom system wins out? Yes, there are. In some instances the 80 meter dipole fed with a Maxcom matcher will give stronger signals than a nonresonant dipole fed directly with coax. Such a condition causes a high SWR to exist on the feedline, and that in turn causes feedline losses to rise, especially on the higher frequencies.

Suppose an antenna has a 3:1 SWR at the transmitter at 21 MHz, and the feedline has a nominal loss of 2 dB at that frequency. The high SWR will cause an additional loss of 3 db for a total of 5 dB feedline loss. Here, the Maxcom may very well outperform the nonresonant dipole fed directly with coax, especially considering nearly all solid state transceivers will operate only at reduced power output, if at all, when faced with a 3:1 SWR.

The Maxcom matcher in this case may still have relatively high losses, but with a low SWR present on the feedline other losses will be low, and power output from the transceiver will remain at maximum. The result is more radiated power is radiated with the Maxcom.

Cost Considerations

Maxcom Automatic Antenna Matchers are not cheap. Retail price for the 200D is $599. The XLD-150 runs $299. The buyer should balance the units' cost with other considerations such as power ratings and installation requirements. If the Maxcom has a place in the amateur market, it is for folks who like the convenience of coaxial feedlines, have room for one antenna, and primarily work stations with strong signals.

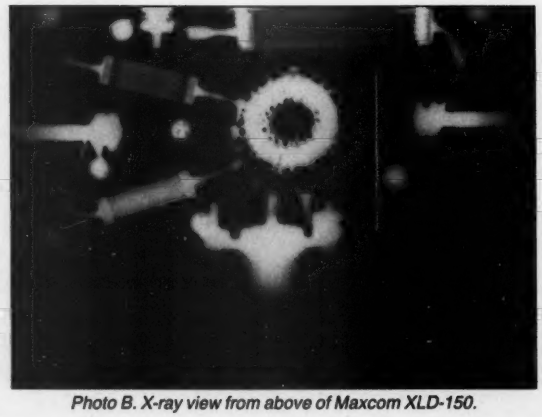


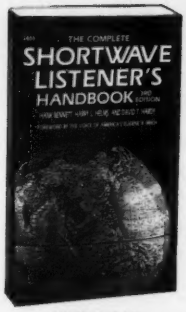
Photo B. X-ray view from above of Maxcom XLD-150.

SELECT 5 BOOKS

for only $3.95

(values to $134.70)

and get a Free Gift!



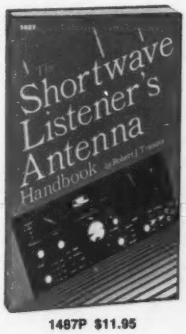
2655P $16.95

1740P $10.00

1305P $10.95

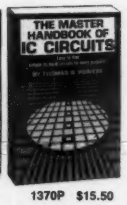
1185P $10.95

1367P $17.95



1487P $11.95

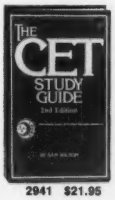
1999 $21.95



1370P $15.50

2635 $19.95

800P $19.95



2941 $21.95

2722P $14.95

Electronics projects . . . ideas . . . the latest technology all at up to 50% off publishers' prices

1482P $15.95

1218P $14.95

2701P $17.95

Membership Benefits • **Big Savings.** In addition to this introductory offer, you keep saving substantially with members' prices of up to 50% off the publishers' prices. • **Bonus Books.** Starting immediately, you will be eligible for our Bonus Book Plan, with savings of up to 80% off publishers' prices. • **Club News Bulletins.** 14 times per year you will receive the Book Club News, describing all the current selections—mains, alternates, extras—plus bonus offers and special sales, with hundreds of titles to choose from. • **Automatic Order.** If you want the Main Selection, do nothing and it will be sent to you automatically. If you prefer another selection, or no book at all, simply indicate your choice on the reply form provided. As a member, you agree to purchase at least 3 books within the next 12 months and may resign at any time thereafter. • **Ironclad No-Risk Guarantee.** If not satisfied with your books, return them within 10 days without obligation! • **Exceptional Quality.** All books are quality publishers' editions

1553 $15.95

1964P $10.95

© 1988 ELECTRONICS BOOK CLUB®, Blue Ridge Summit, PA 17294-0810

FREE when you join!

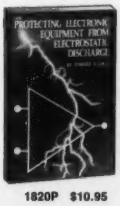
How To Be a Ham—3rd Edition

All you need to prepare for amateur license tests from novice through extra!

(a $12.95 value)

1327P $9.95

2758 $19.95



1820P $10.95

1625P $14.95

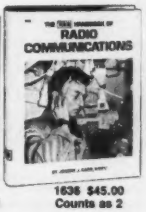
2922 $24.95

2750 $25.95

2826 $17.95

1536P $8.95

1498P $11.95



1636 $45.00
Counts as 2

ELECTRONICS BOOK CLUB®

Blue Ridge Summit, PA 17294-0810

Please accept my membership in the Electronics Book Club® and send the 5 volumes listed below, *plus* my FREE copy of *How To Be a Ham—3rd Edition* (2653P) billing me $3.95 plus shipping and handling charges. If not satisfied, I may return the books within ten days without obligation and hae my membership canceled. I agree to purchase at least 3 books at regulra Club prices (plus shipping/handling) during the next 12 months, and may resign any time thereafter.

Name _____

Address _____

State/Zip _____ Phone _____

Signature _____

Valid for new members only. Foreign applicants will receive special ordering instructions. Canada *must* remit in U.S. currency. This order subject to acceptance by the Electronics Book Club®.

Signature of parent or guardian required for all new members under 18 years of age.

All books are hardcovor unless numbers are followed by a "P" for paperback.

STAR-388

CIRCLE 128 ON READER SERVICE CARD

Introducing

the True Value Software

TVS-701B REPEATER CONTROLLER

Controls Repeaters & Remote Links and is Fully Remotely Configurable (no ROMS-no jumpers)

The 701B also monitors batteries, power levels, etc. w/voltage telemetry and alarm features.

Protection– Power failure protected w/watchdog timer & EEPROM
Security– Four levels of control security
Versatility– 74 functions and digital inputs/outputs for auxiliary control & alarms
Reliability– 50 accumulated years of mountaintop operation

ALL YOURS FOR LESS!

Easy to build kit price. $190
Assembled and tested. $300

CALL OR WRITE TO NOW:

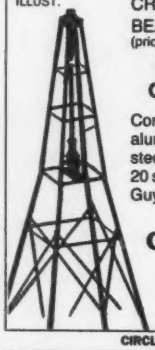
True Value Software
2805 E. Sherran Ln.
Phoenix, AZ 85016
602-956-4259

CIRCLE 307 ON READER SERVICE CARD

CREATE
Creative Design Co., Ltd.

ROOF TOWERS!

A size to fit your needs



CR18	6 ft.	$139.00
CR30	10 ft.	$239.00
CR45	15 ft.	$349.00
BEARING		$ 39.00

(prices do not include shipping)

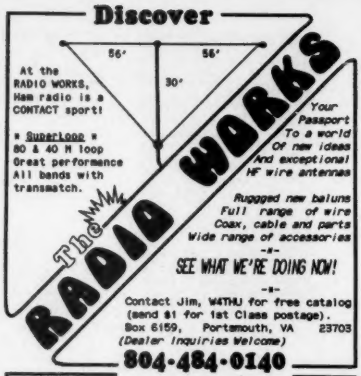
1-800-255-7020
CA 818 888-4927

Constructed of high quality aluminum with galvinized steel bracing supports. Over 20 sq. ft. of antennas! Guying is required.

ORION HI-TECH
P.O. Box 8771,
Calabasas, CA.
91302

CIRCLE 167 ON READER SERVICE CARD

Discover


56'
56'
30'
At the RADIO WORKS, Ham radio is a CONTACT sport!
* SuperLoop *
80 & 40 M loop
Great performance
All bands with transmatch.
The RADIO WORKS
Your Passport To a world Of new ideas And exceptional HF wire antennas
Rugged new baluns
Full range of wire
Coax, cable and parts
Wide range of accessories
-#-
SEE WHAT WE'RE DOING NOW!
-#-
Contact Jim, W4THJ for free catalog (send $1 for 1st Class postage).
Box 6159, Portsmouth, VA 23703
(Dealer Inquiries Welcome)

804-484-0140

Something New! ** CAROLINA WINDOM **

The best 75 M antenna around? Probably! When you hear one, you'll want one. You can use it on all bands with a transmatch. Feed it with coax.

ALL RADIO WORKS PRODUCTS ARE MADE WITH PRIDE ON THE AMERICAN SIDE, IN VA/USA.

CIRCLE 150 ON READER SERVICE CARD

ANNOUNCING THE VECTOR VR-50 SSB COMMUNICATOR

SAVE $100
OFF FACTORY PRICE-NOW ONLY $1195

Finally there is an affordable powerful (50 W) solar powered HF-SSB transceiver for the Amateur. Works anywhere—easily deployed antenna system—built in antenna tuner—stable crystal controlled circuitry on any amateur, MARS or CAP frequency (SSB or CW) from 1.8 to 17 mHz (except 4.7–5.1)—all in a bright yellow unsinkable housing/carrying case. Many optional accessories. System available now! Call or write for detailed brochure.

A X M Incorporated
11791 Leara Street
Garden Grove, Calif. 92640
(714) 638-8807

CIRCLE 243 ON READER SERVICE CARD

CONTACT YOUR DEALER FOR MORE INFORMATION

Amateur Radio Baluns-
Traps-Remote Coaxial Switches

Or Write To:

UNADILLA DIV. of ANTENNA'S ETC.
P.O. Box 215 BV ANDOVER, MA. 01810

617-475-7831

CIRCLE 136 ON READER SERVICE CARD

SRC-10 REPEATER/LINK CONTROLLER

DTMF muting
Intelligent ID'er
Auxiliary outputs
Easy to interface
Alarm monitor input
Telemetry response tones
Low power CMOS, 22ma @ 12v
Detailed application manual
Programmable COS polarities
Repeater & link courtesy tones
Synthesized link/remote base capability

$149.00 *Assembled & Tested*

CREATIVE CONTROL PRODUCTS
3185 Bunting Avenue
Grand Junction, CO 81504
(303) 434-9405

CIRCLE 306 ON READER SERVICE CARD

EQUIP-tips

By Bob Grove
WA4PYQ

Tips from the expert on boosting the performance of your radio equipment.

Boost the Range of Hand-Helds

Today's hand-held VHF/UHF scanners and handie-talkies from Bearcat, Regency, Cobra, and Radio Shack, ICOM, Yaesu, and Kenwood have excellent sensitivity and talk power, but their range is reduced by their short flex antennas.

Tip: To increase the range of your hand-held scanner or transceiver, connect a Grove ANT-8 extendable whip antenna, equipped with standard BNC base.

The Grove ANT-8 is a fully-adjustable, professional whip antenna made of chrome-plated brass and equipped with a standard BNC base to fit most hand-held radios. Length is extendable from 7 to 46 inches. Replace that inefficient "rubber duckie" with the ANT-8 and *STAND BACK!*

Only $12.95 plus $1.50 UPS Shipping (US)

Grove Enterprises
140 Dog Branch Road Brasstown, N.C. 28902
(704) 837-9200 or (MC, Visa & COD only) 1-800-438-8155

CIRCLE 169 ON READER SERVICE CARD

DOWN EAST MICROWAVE

MICROWAVE ANTENNAS AND EQUIPMENT

• Loop Yagis • Power Dividers • Linear Amplifiers • Complete Arrays • Microwave Transverters • GaAsFET Preamps • TROPO • EME • Weak Signal • OSCAR • 902 • 1269 • 1296 • 2304 • 2400 • 3456 MHz

2345 LY	45el	loop Yagi	1296 MHz	20dBI	$83
1345 LY	45el	loop Yagi	2304 MHz	20dBI	$80
3333 LY	33el	loop Yagi	902 MHz	16.5dBI	$83

Above antennas assembled and tested. Kits available.
All Aluminum and Stainless Construction.
Add $8 UPS S/H, $11 West of the Missisippi.
2316 PA Linear Amp 1W in 16W out 1296 MHz 13.5V. $250 ppd.
2335 PA Linear Amp 10W in 35W out 1296 MHz 12.5V. $300 ppd.

NEW! MICROWAVE TRANSVERTERS BY LMW ELECTRONICS

1296TRV8D 6W, GaAsFET, T/R Sequencer, Output Meter $569
2304TRV2D 2W, GaAsFET, T/R Sequencer, Output Meter $659

Add $6 for shipping UPS/48
Stripped down version, kits also available
Write For FREE Catalog

DOWN EAST MICROWAVE
Bill Olson, W3HQT
Box 2310 RR1, Troy, ME 04987 U.S.A.
(207) 948-3741

Number 18 on your Feedback card

NEW PRODUCTS

Compiled by Rebecca Niemela

PRODUCT OF THE MONTH

ICOM's Dazzling IC-781 HF Base Station Transceiver

Every feature imaginable and some you wouldn't even have dreamed of are found in the IC-781. It operates all modes and bands 160 to 10 meters with a band spectrum scope that displays signals in a 50/100/200KHz range of operating frequency. The multi-function 5″ CRT screen displays frequencies, modes, memory contents, operating notes, RIT, two menu screens and subdisplays for packet and RTTY.

And what else? Dual band watch; twin passband tuning; 99 tunable memories; all wide and narrow filters; direct keyboard entry; 150 Watt output; built-in power supply; dual noise blanker; five multi-function timers; two internal clocks and all the standards you can think of.

For pricing and additional information, contact ICOM at 1777 Phoenix Parkway, Suite 201, Atlanta GA 30349 (404/991-6327).

The 21-Day Novice Course from Gordon West Radio School.

21-DAY NOVICE COURSE

Thirty prominent amateur radio equipment manufacturers and accessory suppliers, plus five amateur radio dealers, are taking part in the Gordon West School Novice welcome package. Their literature sheets, rebate coupons, and in-store discount offers are included with every 21-day Novice course sent out to home study mail order students.

The Gordon West 21-day Novice course includes two stereo code-learning cassettes plus the West 112-page Novice book. Also included is the FCC Form 610, a reference chart, laminated world map, and a sample Novice exam package. Everything is included for the Novice exam package to pass the test as well as learn more about all of the exciting ham radio equipment and accessories available for their new hobby.

The 21-day Novice course with all literature and rebates is $22.50 including postage.

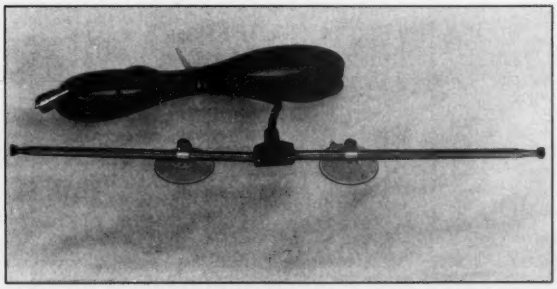
For more information, write Gordon West Radio School, 2141 College Drive, Costa Mesa CA 92626. Or circle Reader Service 201.

ELECTRON PROCESSING

The new Vak-Tenna is the ideal antenna for apartments, offices, travelers and mobiles. Receive coverage from 30-500 MHz includes fire, police, aviation, FM TV, amateur, business, VHF Lo/Hi, and marine. The transmit coverage from 70-230 MHz with 1.5:1 VSWR at 50 Ohms and power levels up to 50 Watts. The Vak-Tenna contains two telescoping antenna elements that together extend to a maximum of 79″ and collapse to 20″.

There are two powerful section cups that hold the antenna to any smooth surface for weeks. A 15' length of RG-58U coax cable is provided with either a BNC, PL-259, Motorola or F connector for connection to your equipment. The Vak-Tenna is only $30.

More information is available from Electron Processing, Inc., P.O. Box 708, Medford NY 11763; 516-764-9798. Or circle Reader Service number 202.



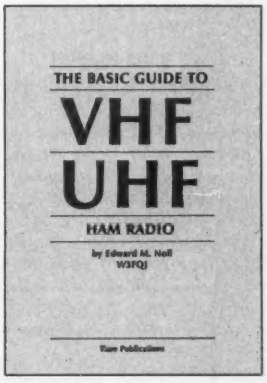
Vak-Tenna from Electron Processing

TIARE PUBLICATIONS

The Basic Guide to VHF/UHF Ham Radio has just been published by Tiare Publications. It was written by ham radio and technical writer Edward M. Knoll W3FQJ.

This new volume provides a down-to-earth basic introduction to amateur radio operating on the 2, 6 and 1.25 meter bands as well as 23, 33 and 70CM. The book presents a clear and easily understood look at VHF/UHF equipment, antennas, operating techniques, repeaters, contesting and awards. Band plans for each of the VHF/UHF bands are also included. The Basic Guide to VHF/UHF Ham Radio, by Edward M. Noll W3FQJ, is available from Tiare Publications for $8 including postage.

More information is available from Tiare Publications, P.O. Box 493, Lake Geneva WI 53147. Or circle Reader Service number 203.



Tiare Publications' Guide to VHF/UHF Ham Radio.

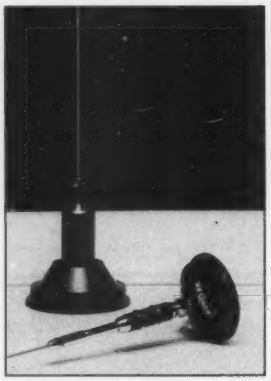
HUSTLER, INC.

Hustler is proud to announce the development of two new series of magnetic mount antennas. Rated at 100 Watts, the RX series (pictured horizontally) consists of a ⅝ wave, 3.4 dB antenna on a magnet mount which holds at speeds to 75 MPH. The RX-2 (2 meters) and the RX-220 (220 MHz) are chrome with a black

mount and coil cover. Both models carry a suggested list price of $20. The RX series is available in all-black versions, models RX-2B and RX-220B, each of which have a list price of $25.

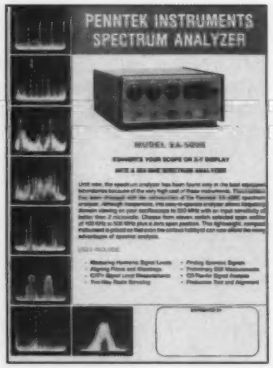
The FX series (pictured upright) is rated at 200 Watts and consists of a ⅝ wave, 3.4 dB antenna on a heavy-duty magnet mount which holds at speeds in excess of 100 MPH. The FX-2 (2 meters) and the FX-220 (220 MHz) have a list price of $25 each. All black versions of the FX series are available as models FX-2B and FX-220B with a suggested list price of $30 each.

For more information on these products, contact Hustler, Inc., One New-Tronics Place, Mineral Wells TX 76067; 817-325-1386.



Hustler offers two new antennas.

Or circle Reader Service number 204.



Penntek Instruments introduces its Spectrum Analyzer.

PENNTEK INSTRUMENTS

Penntek Instruments announces the introduction of its new SA-500E 550 MHz Spectrum Analyzer. When connected to your X-Y display or oscilloscope, this instrument allows frequency domain signal viewing with an on-screen dynamic range of 70 dB. The display center frequency is adjustable from 1 to 550 MHz and is shown on the front panel digital meter. A precision 70 dB front panel RF input step-attenuator is included as a crystal-controlled frequency marker at 5 and 50 MHz intervals. It can be used for measuring harmonic signal levels, finding spurious signals, CATV signal level measurements, off-the-air signal analysis, production test and alignment, and two-way radio servicing. The price is $1,495, delivery stock to 3 weeks.

Write or call Penntek Instruments, 14 Peace Drive, Lewistown PA 17044 (717-248-2507) for more information. Or circle Reader Service number 205.

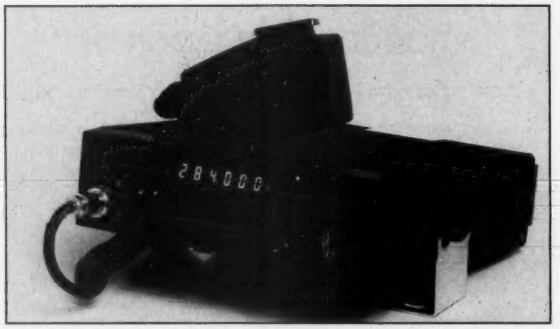
MFJ ENTERPRISES

MFJ Enterprises announces its new MFJ-1278 Multi-mode Data Controller that lets you work seven digital modes: Packet, ASCII, RTTY, CW, WEFAX, SSTV, and contest memory keyer modes. The MFJ-1278 retails for $250. It features high performance HF/VHF/CW modems software selectable dual radio ports, precision tuning indicator, 32K RAM and an AC power supply. Not included is a Starter Pack to get MFJ1278 users on the air instantly. The Starter Pack includes computer interface cable, terminal software and friendly instructions. It is available for the Commodore 64/128, VIC-20 (MFJ-1282, disk; MFJ-1283, tape) and for the IBM or compatible (MFJ-1284), for $20 each. The MFJ-1278 comes with MFJ's unsurpassed double guarantee. If ordered from MFJ, it may be returned within 30 days for a full refund, less shipping.

MFJ also backs this product with a one-year unconditional guarantee.

For additional information on all these products contact: MFJ Enterprises, Inc., P.O. Box 494, Mississippi State MS 39762; 800-647-1800, or 601-323-5869, or Telex 53-4590 MFJSTKV. Or circle Reader Service number 206.

MFJ's data controller.



Clear Channel's mobile transceiver.

CLEAR CHANNEL CORP.

Clear Channel Corp. would like to introduce their new AR-3500 all-mode mobile transceiver. It is loaded with 20 features, some of which are memory switch, LED frequency display, mode display, split program switch for repeater offsets, and many more. The frequency range for transmitting and receiving is 28.0000-29.9999 MHz. There are two different models, the 30 watt and the 100 watt. The 30 watt's suggested retail price is $319, and the 100 watt is only $409. These products are available in-stock.

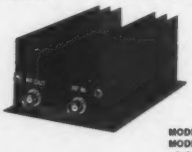
Contact RF Parts Co., 1320 Grand, San Marcos CA 92069; 619-744-0728 or circle Reader Service number 208 for more information.

CALL LONG DISTANCE ON YOUR HANDHELD

35 WATT and 75 WATT 2-METER AMPLIFIERS

The **MODEL 335A** will deliver 35 watts of power using the latest state-of-the-art circuitry. The amplifier will operate SSB or FM and is compatible with most handheld transceivers, including the TR2400, TR2500, TR2600, IC-2AT, Yaesu, Santec, and TenTec. Only 300 mw input will deliver 5 watts out; 3 watts in will deliver 35 watts out. Maximum input level is 5 watts.

We specialize in carrying a complete parts list for the 140 and 300 watt HF amplifiers as described in the **MOTOROLA** Bulletins EB-27A, AN-758, EB-63, AN-762 and as described in the **ARRL** Handbook. We also carry a line of **ATV** equipment for 70 and 33 CM. For detailed information and prices, call or write for our free catalog.



MODEL 335A (35watt) Kit $ 79.95
MODEL 875A (75watt) Kit $119.95
(add $2.00 Shipping and Handling)

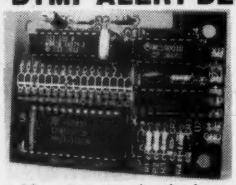
VISA

CCI Communication Concepts Inc.

121 Brown Street * Dayton,Ohio 45402 * (513) 220-0677

CIRCLE 99 ON READER SERVICE CARD

NET-KALL NK-1
DTMF ALERT DECODER



From Only **$34.95!**

- Momentary or latched output
- Multiple Group-Call response
- High stability xtal controlled SSI-202
- Ideal for an economical alert system

VISA NK-1K (kit) $34.95
NK-1W (Wired/Tested) $44.95
(Add $2.00 Shipping/Handling in U.S.A)

MoTron Electronics
695 W. 21st Ave.
Eugene, OR 97405

Call Toll-Free
1-800-338-9058
or (503) 687-2118

CIRCLE 127 ON READER SERVICE CARD

THEY'LL THINK THEY'RE JUST HAVING FUN

YOU'LL KNOW THEY'RE LEARNING

Carole Perry's (Dayton 1987 Ham of The Year) **"Introduction To Amateur Radio" package allows children of all abilities to achieve success.**

Ready-to-teach package contains: Teacher's Manual with 26 lesson plans, Code Practice Oscillator for Morse Code practice, Spacecode audiocassette which follows lesson plans.

☐ Any motivated teacher can teach the program.
☐ Ham Radio program is used as a motivational tool to teach skills in other subject areas.
☐ 24 hour Hotline is available for help and questions.
☐ High motivational activities, homeworks, fund raisers, quizzes, & reproducibles included.

Media Mentors inc.
P.O. BOX 1646
STATEN ISLAND, N.Y. 10314
718 983-1416

LIMITED TIME ONLY—FREE VIDEO CASSETTE SHOWING CLASSROOM USE

CHECK ONE
☐ **Payment enclosed (shipping and handling FREE)**
☐ **Bill me; school address only (shipping and handling will be added)**

Please send me one package of "Introduction To Amateur Radio" at only $99.95_____
Please send me _____ additional Codekey 1000's at only $19.95 each $_____
Please send me _____ additional Spacecode audiocassettes at only $6.95 each $_____
Take discount of 10% with orders of 5 or more of the same item.
TOTAL PRICE _____
Please include tax exempt number where applicable
Name_____
Title/Position_____
School/Organization_____
Street Address_____
City_____State_____
Zip_____Daytime Phone_____

CIRCLE 241 ON READER SERVICE CARD

800-882-1343

ICOM

	IC-735 List	Juns
IC-761 New Top of Line	2499.00	Call $
IC-735 Gen. Cvg. Xcvr	$999.00	Call $
IC-751A Gen. Cvg. Xcvr	1649.00	Call $
R7000 Gen. Cvg. Rcvr.	1099.00	Call $
R71A Gen. Cvg. Rcvr.	949.00	Call $
IC-28A/H FM Mobile 25w/45w	429/459	Call $
IC-37A FM Mobile 25w	499.00	Call $
IC-900 Super Multi Band Mobile	589.00	Call $
IC-04AT UHF HT	449.00	Call $
IC-48A UHF 45w	459.00	Call $
IC-38A FM Mobile 25w	459.00	Call $
IC-02AT FM HT	399.00	Call $
IC-μ2AT Micro HT	329.00	Call $

KENWOOD

TS-440S/AT

TS-940SAT Gen. Cvg. Xcvr	$2249.95	Call $
TS-430S Gen. Cvg. Xcvr	819.95	Call $
TS-711A All Mode Base 25w	899.95	Call $
TR-751A All Mode Mobile 25w	599.95	Call $
TS-440S/AT Gen. Cvg X cvr.	1199.95	Call $
TM-2530A FM Mobile 25w	429.95	Call $
TM-2550A FM Mobile 45w	469.95	Call $
TM-2570A FM Mobile 70w	559.95	Call $
TH-205 AT, NEW 2m HT	259.95	Call $
TH-215A, 2m HT Has It All	349.95	Call $
TH21BT 2M HT	259.95	Call $
TH31BT 220 HT	269.95	Call $
TM-3530AFM 220MHz 25w	449.95	Call $

YAESU

FT 757GX

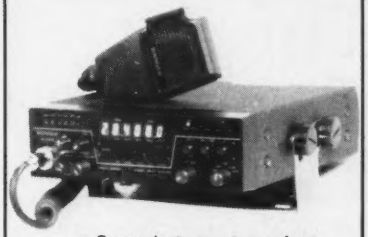
FT-757 GX Gen. Cvg. Xcvr	995.00	Call $
FT-767 4 Band New	1895.00	Call $
FT-211RH	459.95	Call $
FT-290R All Mode Portable	579.95	Call $
FT-23 R/TT Mini HT	299.95	Call $
FT-209RH RM Handheld 5w	359.95	Call $
FT-726R All Mode Xcvr	1095.95	Call $
FT727R 2M/70CM HT	479.95	Call $
FT2700RH 2M/70CM 25w	599.95	Call $

JUN'S ELECTRONICS
3919 Sepulveda Blvd.
Culver City, CA 90230
213-390-8003

CIRCLE 272 ON READER SERVICE CARD

10 METER DX IS HOT!

AND YOU CAN WORK IT WITH THE NEW RANGER AR 3500



- Convenient, easy-to-use front panel controls
- All Mode operation
- Switchable noise blanker—highly effective on ignition noises
- 100 Hz per step
- Programmable band scanning
- Five selectable memory channels
- Split frequency operation
- Easy-to-read LED frequency display
- Available in outputs of 30 & 100 watts
- Microphone and power cord supplied

RECEIVER

Frequency Range: 28.0000-29.9999 MHz
Circuit Type: Superhet, dual conversion
Clarifier Range: ±500 Hz
Sensitivity: SSB & CW better than 0.3 μV for 10 dB S+N/N. FM better than 0.5 μV
Selectivity: -6dB -60dB
SSB, CW 2.6 KHz 4.7 KHz
AM, FM 6.0 KHz 18 KHz

TRANSMITTER

Frequency Range: 28.0000-29.9999 MHz
Power Output: 30 watt Model: SSB—25 Watts, AM/FM—8 watts, CW—30 Watts Input 12.5 VDC, 6A Max
Power Output: 100 watt Model: SSB—100 Watts, AM/FM—30 Watts, CW—150 Watts Input 12.5 VDC, 25A Max

WARRANTY

Limited one year warranty by Clear Channel Corporation of Issaquah, WA.

AR35000-30W (Reg. 359)	Call Us
AR3500-100W (Reg. 449)	Call Us
Scan. Mic & Mod installed	$45.00
SP-1 Speech Processor	33.00
CW Bd. Auto break-in	39.95
3 Element Beam 26-30 MHz	89.50
Penetrator Mobile Ant.	44.95
RS-7A Pwr Sup for 30W	49.95
RS-35A Pwr Sup for 100W	134.95

SEE YOU AT THE ORLANDO, CHARLOTTE & DAYTON HAMFESTS

Quantity Pricing Available **Foreign Orders Accepted**
Orders received by 1 PM PST shipped UPS same day.
COD / VISA / MC **Next day UPS delivery available**
ORDER DESK ONLY — NO TECHNICAL
(800) 854-1927
ORDER LINE and/or TECH HELP
(619) 744-0728
FAX (619) 744-1943

RF PARTS COMPANY
1320 Grand San Marcos
California 92069

PART II OF A FOUR PART SERIES

DRIFTING ALONG THE TELEGRAPH TRAIL

Memoirs of a Former Telegrapher

BY DR. WILLIAM C. HESS, W6CK

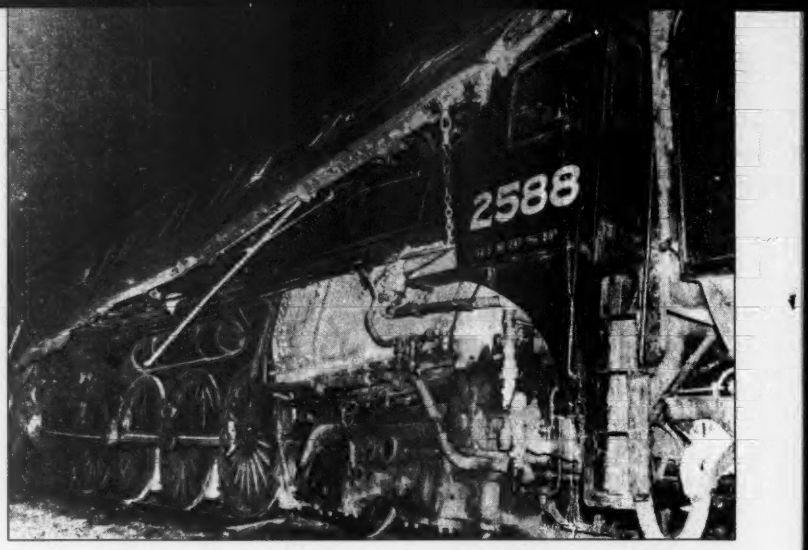


Photo A. The site is a North Dakota village in 1945. The 200-ton Empire Builder crashed into the rear of the observation car, Peoria, whose shell is pictured astride the locomotive. The tragedy was front-page news world-wide.
(Photos courtesy of The Fargo Forum)

I would guess that the telegraph traffic during a whole month in Michigan City in 1945 consisted of not more than ten telegrams sent and ten telegrams received. The astonishing increase one August evening in telegraph traffic from Michigan City was due to a disaster. The second section of the posh *Empire Builder* train crashed into the rear of the first section of that train at seventy miles per hour, right in front of the depot at Michigan City. Thirty-four persons who were occupying the observation car and rear sleeping car of the first section were killed.

The aged gentleman who was the station agent at the site of the disaster sent telegrams all night until 8 AM the next morning. At the ten percent commission allowed him by Western Union for all messages originating at his station, he earned $125 in one night—equal to a month's salary.

During the night, he was "spelled" occasionally by another railroad telegrapher from a nearby town and by a US Navy radio operator—a train passenger who happened to be proficient in both American and International Morse code.

From Tragedy to Comedy

That was a tragedy. Yet, to use an old cliche, my career in telegraphy ran the gamut from the ridiculous to the sublime. At the Western Union office in Torrance, California, I was on duty when a gentleman arrived bearing a large bouquet of flowers picked from his own garden. This was an economy move designed to eliminate the fees charged by the florists in Torrance who were members of the florist's telegraph delivery system. He requested that we telegraph said flowers to his mother in a distant city.

To further reduce the cost of sending flowers to his mother as a Mother's Day gift, he told me: "Look, today is only Saturday and Mother's Day is not until tomorrow, so just send these to her via *Night Letter*," whereupon he handed me the bouquet. (For the benefit of younger readers who may not be familiar with Western Union's operations, Night Letters were much cheaper than regular telegrams and were not delivered until the morning following the day they were sent.)

The Torrance office was also the site of what I call the "snatch-back maneuver." Obviously, when accepting a telegram for transmission, the Western Union clerk must count the number of words in the message, check for misspelled words, and check to see that the sender's name, address and telephone number are included on the telegram so that he may be contacted if there is difficulty in delivering the message.

When I picked up a message filed by one Torrance customer to check it, he immediately snatched it back and said, "Oh, I don't want you to *read* it; this message is *private*."

At the National City Western Union office, immediately adjacent to the huge San Diego Naval Base, a young sailor appeared on a Friday and requested that we immediately have his mother in Atlanta telegraph his baseball uniform to him in time for the big Navy intramural baseball game which was to be played the next day.

I explained to the young man that draping the uniform over the telegraph wire in Atlanta would be no problem at all for us to accomplish and that applying a jolt of electricity to the wire to send the uniform on its way to the West could also be easily done. The problem, I explained patiently, would be that the uniform as it slid along the wire, would soon encounter the wooden crossarms which hold the insulators necessary on every telegraph pole and thus be hopelessly snagged by one of these wooden obstacles. He became quite hostile, not because of my explanation, but rather because he said he knew damn well that flowers and boxes of candy—which were just as large as his folded baseball suit would be—were sent by telegraph all over the United States every day. And what's more, the only reason I wasn't helping him solve his problem was because I didn't *want* to do so.

To many a housewife or person who rarely or perhaps never received a telegram, the yellow telegram envelope with its glassine window displaying the name and address of the addressee on the telegram within is a symbol of only one thing: death. The shocked expression and the sudden absence of facial color are common to persons who rarely receive a telegram. In cases involving delivery of telegrams to housewives, the lady signing for the telegram is very often afraid to open it. She places it on the dining room table until her husband returns from work. Such action, of course, defeats one of the main advantages of a telegram: speed.

On numerous occasions during my telegraphy career, I have sent telegrams to a distant city for a customer and received a reply while he waited, all within fifteen minutes.

(Part 3 of the series will follow next month.) 73

Photo B. The Michigan City wreck required that welders use cutting torches to remove the steel panels from the sides of this Pullman car to free survivors.

Dr. William C. Hess, W6CK, lives in Pasadena CA (PO Box 19/M). He presided over the North Dakota depot of Woburn, a tiny village in North Dakota, from 1937 through 1942.

CIE Cleveland Institute of Electronics

Accredited Member National Home Study Council

CIE is the world's largest independent study electronics school. We offer ten courses covering basic electronics to advanced digital and microprocessor technology. An Associate in Applied Science in Electronics Engineering Technology is also offered.

Study at home — no classes. Programs accredited and eligible for VA benefits.

CIE Cleveland Institute of Electronics
1776 East 17th St., Cleveland, Ohio 44114

YES! I want to get started. Send me my CIE school catalog including details about the Associate Degree program.

Print Name _____

Address _____ Apt. _____

City _____ State _____ Zip _____

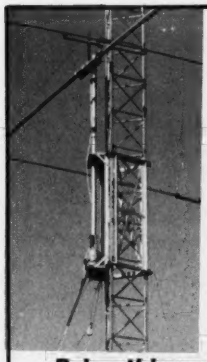
Age _____ Area Code/Phone No. _____

Check box for G.I. Bulletin on Educational Benefits

☐ Veteran ☐ Active Duty MAIL TODAY!

AAR87

CIRCLE 157 ON READER SERVICE CARD



SAVE TIME and MONEY with THE HAZER

Bring things down for safety and convenience.

Never climb your tower again with this elevator system. Antennas and rotator mount on HAZER, complete system trams tower in verticle upright position. Safety lock system operates while raising or lowering. Never can fall.

Complete kit includes winch, 100 ft. of cable, hardware and instructions. For Rohn 20 and 25 G Towers.

Hazer 2 - Heavy duty alum. 12 sq. ft. load	$297.00 ppd.
Hazer 3 - Standard alum. 8 sq. ft. load	$213.00 ppd.
Hazer 4 - Heavy galv. steel 16 sq. ft. load	$278.00 ppd.
Ball Thrust bearing TB-25 for any of above	$49.50 ppd.

KENPRO Antenna Rotors

KR-400	11 sq. ft. Azimuth Rotor	$214.95 ppd.
KR-600	19 sq. ft. Azimuth Rotor	$299.95 ppd.
KR-2000	27 sq. ft. Azimuth Rotor	$549.95 ppd.
KR-5400	AZ-EL Satellite Rotor	$399.95 ppd.

Send for free details of aluminum towers specifically engineered for use with the Hazer.

Satisfaction guaranteed. Call today and charge to Visa, MasterCharge or mail check or money order.

GLEN MARTIN ENGINEERING INC
Rte. 3 Box 322
Boonville, Mo. 65233
816-882-2734

CIRCLE 72 ON READER SERVICE CARD

Above and Beyond

AR2002

PROFESSIONAL MONITOR RECEIVER

25 – 550 MHz

800 – 1300 MHz

Specifications:

Receiving mode – Narrow band FM, Wide band FM & AM

Receiver circuit – Microprocessor controlled PLL Frequency synthesized superheterodyne type with high-level doubled balanced mixer

Receiver IF – 750MHz, 45.03MHz, 5.5 MHz (WFM) and 455kHz (NFM & AM)

Sensitivity – NFM – 0.35 uV (12dB SINAD)
WFM – 1.00 uV (12dB SINAD)
AM – 1.00 uV (10dB S/N)

Selectivity – NFM – ±7.5kHz @ 6dB
±20kHz @ 70dB
WFM – ±50kHz @ 6dB
±250kHz @ 60dB
AM – ±5.0kHz @ 6dB
±10kHz @ 70dB

Number of memory channel – 20 channels
Scan rate – 5 channels per second
Search rate – 6 seconds per MHz
Antenna connector – Standard BNC type, 50-ohm
Audio output power – 1 watt at less than 10% THD
Power requirement – 12 to 14Vdc at 300 to 500mA
Size and weight – 5.4"W x 3.15"H x 7.88"D, 2.6 lbs

Options

Cradled mobile mounting bracket
Trunk lip mobile antenna with 12 ft cable
Discone base antenna with 50 ft cable
RS-232C interface unit

Please: No Dealer Inquiries

AR2002
Professional Monitor Receiver
$455.00
(California residents add $27.30 tax)

Visa and MasterCard accepted
Prices includes shipping & handling
C.O.D. slightly higher

22511 Aspan Street, Lake Forest, CA 92630-6321
Calif./Alaska (714) 581-4900
Facsimile (714) 768-4410 (not a phone)
TOLL FREE 1-800-523-6366

ACE communications, inc.

CIRCLE 279 ON READER SERVICE CARD

Free

Famous hi-tech catalog

A very special guide to what the exciting world of computer and electronics kit-building can do for you.

The informative Heathkit Catalog shows you more than 450 exciting electronic products that will challenge, instruct, and entertain you. You'll find countless kits that you can build and enjoy, from computers and robots to color tv's and a variety of home products. And each is backed by our years of experience and our promise, "We won't let you fail."

IBM-PC Compatible Expandable Computers

HERO® 2000 Educational Robot and Courseware

Precision Test Instruments

Electronic Keyless Doorlock

PackKit Multi-Mode TNC

Send NOW for your FREE Heathkit Catalog.

Send to: Heath Company, Dept. 011-632
Benton Harbor, Michigan 49022

Name _____

Address _____

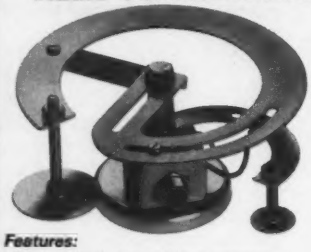
City _____ State _____ Zip _____

A subsidiary of Zenith Electronics Corporation CL-784R3

Heathkit
Heath Company

UNtenna™

Unique Low Profile Antenna for Radio Communication



Features:
- Higher "Q" than whip antennas
- 95% height reduction
- 27-500 MHz (HF, VHF, & UHF)
- Easily and precisely tuned
- Omnidirectional (vertically polarized)
- Optional Radome disguises installation and protects antenna against damage.

The ideal mobile, portable or fixed antenna for military, business, or industrial transceivers. Perfect for common carriers, public safety, wireless security systems, government, forestry, marine and aircraft use. Ideal for surreptitious, under-the-vehicle mounting. *Write for brochure.*

COM-RAD INDUSTRIES
1635 West River Road, P.O. Box 554
Grand Island, NY 14072-0554
(716) 773-1445

CIRCLE 160 ON READER SERVICE CARD

LICENSE PLATES FOR HAMS

YOUR CALL on a white aluminum plate. Choice of blue, black, red or green message. Order now and receive a FREE engraved door/desk sign with choice of message on a woodgrain finish. $24.95 Incl. P/H

ENGRAVED DOOR/DESK SIGN
(Woodgrain or gold finish) alone is $14.00 Incl. P/H (2x8)

ENGRAVED NAME/CALL PIN
(Woodgrain or gold finish) $6.00 Incl. P/H

***ON THE AIR*—SIGNS FOR HAMS**

It's incredible. Your rarest DX and you're about to be interrupted, and it won't be from QRM. It's coming from in your own home. But now your new "ON THE AIR" sign is lit. No one will disturb you this time. A strong and lightweight 8x4½x2 box. Red front with clear lighted letters. A safe 12 volt system from a professional sign company. High tech magnetic mount. Perfect for the serious ham. $50.00 Incl. P/H.

LIT SIGNS (AVAILABLE W/ CALL SIGN ALONE OR IN ADDITION TO "ON THE AIR")—PLEASE SPECIFY YOUR CHOICE OF WORDING.
Add $10.00 for call sign.

Send check or money order to:
JEFF'S SIGNS, WA3FQA, 1231 Garfield Rd.,
Havertown, PA 19083, (215) 449-0594

CIRCLE 248 ON READER SERVICE CARD

CABLE-TV

signal remover

50dB NOTCH FILTER

Any* signal coming in on your cable can be completely "removed" with this powerful filter. Particularly useful on "pay" channels. Also can be used to eliminate any* over-the-air signal which prevents normal reception. The filter's external adjustments allow precise tuning to any frequency required.

***AVAILABLE FOR THE FOLLOWING CHANNELS:**

MODEL 26 - For any channel between 2 and 6 (Tuning range 54 - 108 Mhz)
MODEL 713 - For any channel between 7 and 13 (Tuning range 174 - 216 Mhz)
MODEL 1422 - For any channel between 14(A) and 22(I) (Tuning range 120 - 174 Mhz)

★★ ONLY $30 EACH ★★ 30 DAY FREE TRIAL ★★
To order, send $30 check or money order. Specify Model. If not completely satisfied, simply return within 30 days for a full and speedy refund.

★ All models in stock ★ One year warranty
★ Fast, free delivery ★ Quantity discounts to 50%

STAR CIRCUITS/DEPT. A
P.O. BOX 8332, PEMBROKE PINES, FL 33084

MICROPOWER-2

PACKET CONTROLLER

A VERY LOW POWER TNC-2 CLONE, PERFECT FOR PORTABLE OR SOLAR POWERED OPERATION.

- ONLY 40 MA AT 9-13 VOLTS DC
- SMALL AND LIGHTWEIGHT (5"x7"x1^3/$_8$" - 22 oz.)
- HARDWARE HDLC, BATTERY BACKED 32K RAM
- QUALITY EXTRUDED ALUMINUM CABINET WITH BAKED WRINKLE FINISH
- SUPPORTS BOTH RS-232 AND TTL COMPUTERS
- USES TNC-2 EPROMS - INCLUDING NET/ROM FIRMWARE VERSION 1.1.5 PROVIDED

ASSEMBLED AND TESTED ONLY $179.95

PC-100 SERIES

SINGLE AND DUAL PORT PACKET CONTROLLERS ON A PC PLUG-IN CARD

- DOES AX.25 AND TCP/IP WITHOUT AN EXTERNAL TNC OR INTERFACE
- POWERFUL SOFTWARE PROVIDED ON PC COMPATIBLE DISKETTE
- SWITCHABLE FOR EITHER HF OR VHF TONES
- HARDWARE HDLC, IC MODEMS
- CONNECTS DIRECTLY TO RADIO - NO EXTERNAL INTERFACE NEEDED
- PROVISION FOR EXTERNAL HIGH SPEED MODEM

PC-110 SINGLE PORT $169.95
PC-120 DUAL PORT $199.95

WRITE OR CALL FOR OUR NEW CATALOG OF PACKET EQUIPMENT, SOFTWARE AND ACCESSORIES.

TOLL FREE (ORDERS ONLY) 800-223-3511 EXCEPT FLORIDA

VISA MasterCard DISCOVER

PAC-COMM, 3652 West Cypress St., Tampa, FL 33607

FLORIDA ADDRESSES ADD 5%. $3.00 SHIPPING/HANDLING PER ORDER.

TECHNICAL INFORMATION
7:30 AM - 11 PM EASTERN
(813) 874-2980
TELEX: 650-288-1526 MCI
FAX: (813) 872-8696

CIRCLE 152 ON READER SERVICE CARD

UNCLE WAYNE'S

BOOK SHELVES

The World Is Yours For Only $5.00

Yes, places you've never even heard of! Nearly 400 DX countries gleaned from the Awards Lists of dozens of IARU members—more countries than any other map available anywhere! ARRL's DXCC map doesn't even come close!

73 Magazine offers readers our giant DX Map of the World for the absurdly low price of only $5.00.

Order now....

Code Tapes

We've had so many phone calls from people wanting our famous 73 code tapes that we've decided to bring them back!

Genesis

5 wpm–This is the beginning tape, taking you through the 26 letters, 10 numbers and necessary punctuation, complete with practice every step of the way. The ease of learning gives confidence even to the faint of heart.

The Stickler

6+ wpm–This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are sent at 13 wpm and spaced at 5 wpm. Code groups are entirely random characters sent in groups of five—definitely not memorizable!

Back Breaker

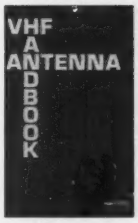
13+ wpm–Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language at only 13 per. You'll need this extra margin to overcome the sheer panic universal in most test situations. You've come this far, so don't get code shy now!

Courageous

20+ wpm–Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the Extra class license. We send the code faster than 20 per. It's like wearing lead weights on your feet when you run; you'll wonder why the examiner is sending so slowly!

Classics from the 73 Library

- **The Magic of Ham Radio**, by Jerold Swank W8HXR, begins with a brief history of amateur radio and Jerry's involvement in it. Part 2 details many of ham radio's heroic moments. Hamdom's close ties with the continent of Antarctica are the subject of Part 3. In Part 4 the strange and humorous sides of ham life get their due. And what of the future? Part 5 peers into the crystal ball. Only $4.95.
- **The Contest Cookbook**, by Bill Zachary N6OP. One of ham radio's winningest contesters lets you in on the tips and techniques of the Big Guns. You'll learn which duping method to use, find out what equipment you'll need, and discover the secret of building a pileup. Includes separate chapters on DX and domestic contests. $5.95 while they last!
- **99 Test Equipment Projects:** You can build virtually all the test equipment you'll ever need with this book. It's chock-full of projects for meters, calibrators, counters, signal generators, power supplies, and more!
- **The Propagation Wizard's Handbook**, John Nelson, formerly Senior Propagation Analyst for RCA, shares his noval and reliable propagation prediction techniques. Easy reading and informative.
- **The Practical Handbook of Amateur Radio FM & Repeaters**, by Bill Pasternak WA6ITF. With Mike Morris WA6ILQ Technical Advisor. Solid advice on how to use, design, and build a ham radio repeater. A bargain at $9.95.
- **Master Handbook of Ham Radio Circuits**, by the Editors of *73 Magazine*. A rich collection of more than 100 practical, unique, tested circuits created by hams for hams. A mere $8.95!
- **Software for Amateur Radio**, by Joe Kasser G3ZCZ. Here's a treasure trove of practical, useful computer programs and applications ideas that will prove invaluable to any amateur radio enthusiast. A wealth of information for $15.95.
- **VHF Antenna Handbook**, edited by Alex Barvicks WB4RVH, a *73* Publication. If you've been bitten by the ham bug, you'll want to whip together these antennas for most of the VHF bands. Fun Stuff for only $5.95!



Books

The Magic of Ham Radio	$4.95	
The Contest Cookbook	$5.95	
99 Test Equipment Projects	$7.95	
The Propagation Wizard's Handbook	$6.95	
The Practical Handbook of Amateur Radio FM Repeaters	$9.95	
Master Handbook of Ham Radio Circuits	$8.95	
Software for Amateur Radio	$15.95	
VHF Antenna Handbook	$5.95	
Postage and Handling	**$1.00**	

Code Tapes

Genesis	$6.95	
The Stickler	$6.95	
Back Breaker	$6.95	
Courageous	$6.95	
Postage and Handling	**$1.00**	

Giant DX Map of the World	$5.00	
Postage and Handling	**$1.00**	Total Enclosed

Please print!

Name _____ **Call** _____

Address _____

City _____ **State** _____ **Zip** _____

☐ AE ☐ MC ☐ VISA ☐ Check/MO

Card # _____ **Exp. Date** _____

Mail your order to *73* Magazine, WGE Center, Peterborough NH 03458, Attn: Uncle Wayne.

Permission Granted to Photocopy

ATV

Ham Television

Mike Stone WB8QCD
PO Box H
Lowden IA 52255

In several years of polled studies the USATVS (Untied States Amateur Television Society) verified that most of the country uses horizontal polarization for the Fast Scan TV UHF mode. Nearly all of the Midwest, from the Rockies to the Great Plains States, and eastward to the Atlantic states utilize H-plane (horizontal) radiation patterns. There are a few exceptions in Omaha, Cedar Rapids, and Indianapolis. Omaha's system uses commercial decibel product gain antennas at the 600 foot level of a broadcast TV/Radio tower. Ice and wind conditions would just not allow much less than a commercially built, rugged antenna. Other areas, however, in similar situations using a highly elevated antenna array, have indeed found a horizontal solution and beating ole' man winter with slotted antennas.

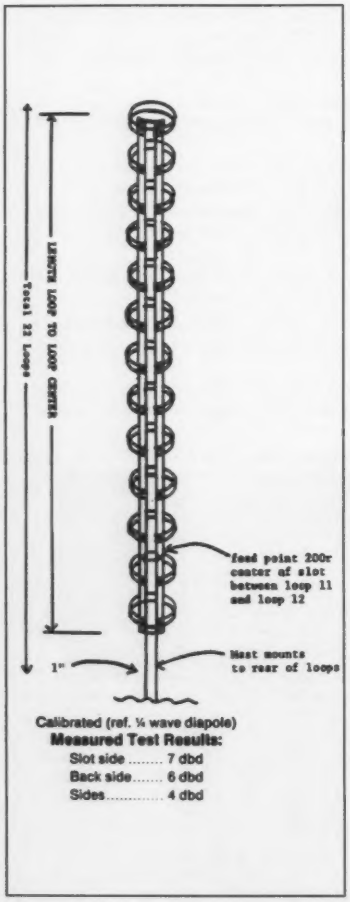

Total 12 Loops
LENGTH LOOP TO LOOP CENTER
feed point 200r center of slot between loop 11 and loop 12
1"
Mast mounts to rear of loops
Calibrated (ref. ¼ wave dipole)
Measured Test Results:
Slot side ..... 7 dbd
Back side..... 6 dbd
Sides..... 4 dbd

Figure 1. This Rib Cage slotted antenna design offers nearly true omnidirectional, horizontal polarization with 5-7 dBd gain.

Parts of Florida, some areas of Texas and nearly all of California use vertical polarization. This varying local choice standard is best illustrated on pages 18 and 19 of the USATVS's new North American ATV Directory Guide ($5.95) booklet #101.

For many years, many believed that true omnidirectional, horizontally polarized antennas with gain were unobtainable. Everyone has experimented with or at least heard of Big Wheels, Halos, Squalos, and Crossed Dipoles. Even though these antennas do indeed radiate in the H-plane, they lack sufficient gain to get out very well. The best answer in the past seemed to be "stacking a set of four Big Wheels" for about 4 to 5 dBd of gain. That is, until Merle Reynolds W9DNT of Moline, Illinois (Iowa BRATS ATV Group) and Gerald Cromer K4NHN of Cayce, South Carolina, (Palmetto ATV Group) began reading, learning, re-designing and experimenting with age-old Alford Slot antennas!

The Spec Com Journal has published numerous articles about W9DNT's and K4NHN's fine work using British designed Alford Slot antenna principles. Merle and Gerald had to dig out a lot of hard to find facts about these antennas, which were designed for use above 1000 MHz. The trick was to get them to work down on the 70 cm band where most of the Fast Scan TV signals are located.

Gerald Cromer K4NHN built the " Rib Cage Slot" (Figure 1). K4NHN and WA4UMU both report that this design produces a measured 5-7 dBd of gain and radiates a semi-true horizontally polarized pattern. The pattern has slightly stronger front and back lobes, which may actually prove advantageous in some areas. The unwanted directivity is possibly caused by a slightly too small radiating element circumference.

They have two of these antennas running on the Sumter, South Carolina, ATV/R system. The antennas perform very well with coverage well over 40 miles in all directions—not bad for UHF-TV! Other groups in Pennsylvania, New York, and Connecticut have adopted the Rib Cage design.

W9DNT chose to experiment with the simple and original Alford Slot design. Using 3- to 4-inch round gutter or stove pipe tinned iron material. Merle developed a design for the 420-440 MHz band. A serious technical construction building article was published 2½ years ago in the July 1985, Volume 15, No. 5 issue of Spec Com by W9DNT. Additional updated information on better working, later model designs was recently published a couple months ago in the January 1988 issue. His latest version, a two-element phased, Dual-Slot antenna is shown in Figure 2.

Although his antenna has yet to be officially measured at a VHF/UHF conference, a conservative estimate gives it 5-6 dBd of gain when compared to a single known 7.8 dBd KLM-440-6 beam antenna. It is very omni! The pattern has a slight noticeable minor dip at the back side of the slot opening.

In figure 2, note the ¼ wavelength, 75 to 50 ohm "Q" section match, which is used for the phasing harness. It is fed directly at the center of the slot openings 28 inches from top and bottom. The overall length of the entire antenna is 116 inches. Yes, it is big and tall and a bit awkward, but it works! The BRATS ATV Club's N9CAI ATV/R system in Davenport uses two of these antennas, one for receive and one for transmit. W9DNT found that 3, 3½ or 4 inch stock may be used. A ½ inch slot opening is required for smaller circumference designs and a ¾ inch opening works best for the 4 inch model. A ⅜ to ½ wavelength cut maintains true omni patterns, and any more or less than that causes directional lobes.

The standard formula of 246 (¼ WL) divided by f (frequency in MHz) = amount in feet multiplied by 12 (inches) times the 75 ohm stubs' coaxial velocity factor (either .79 or .66) is used to calculate the phasing harness length. Figure 3 deplicts the final harness arrangement. This harness is taped, sealed and fastened inside the slot antenna housing itself. A type "N" connector is brought out for the main feed line connection point. Note that the lengths of the ohm stubs are not very critical

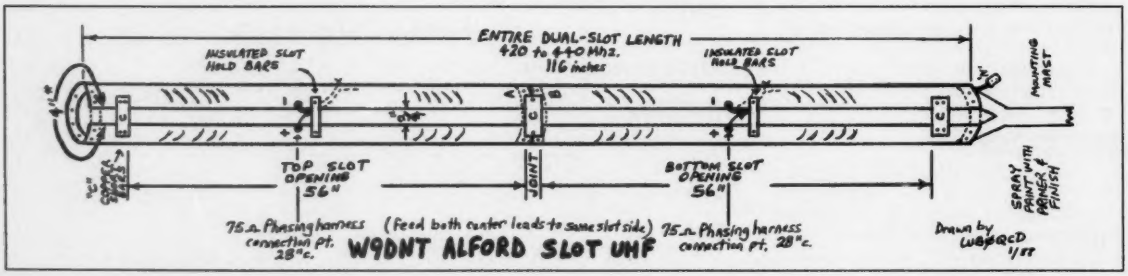

ENTIRE DUAL-SLOT LENGTH
420 to 440 Mhz.
116 inches
INSULATED SLOT HOLD BARS
INSULATED SLOT HOLD BARS
MOUNTING MAST
TOP SLOT OPENING 56"
JOINT
BOTTOM SLOT OPENING 56"
75 ohm Phasing harness connection pt. 28"c.
(Feed both center leads to same slot side)
W9DNT ALFORD SLOT UHF
75 ohm Phasing harness connection pt. 28"c.
SPRAY PAINT WITH PRIMER & FINISH
Drawn by WB8QCD 1/88

Figure 2. The W9DNT Dual-Slot antenna is easy to build from 3- to 4-inch stove pipe. It consists of two phased, stacked elements.

Special

OUTSTANDING PRICES ON IBM XT™ * COMPATIBLE SYSTEMS!

(™) * IBM IS A REGISTERED TRADEMARK OF INTERNATIONAL BUSINESS MACHINES CORP.

SYSTEM #1 $299.00

MOTHERBOARD WITH BIOS AND ZERO K OF RAM UPGRADABLE TO A FULL 640 K RAM. FLIP TOP CASE. XT/AT LOOK ALIKE KEYBOARD. 150 WATT POWER SUPPLY WITH ALL THE POWER NEEDED TO RUN EXTRA DRIVES AND CARDS.

Seagate ST-225, 20 MHz hard drive with control card available with any system for $319.00. Offer good thru 2/29/88. Call for customized systems.

SYSTEM #2 $499.00

MOTHERBOARD WITH BIOS AND ZERO K of RAM UPGRADABLE TO A FULL 640K OF RAM. FLIP TOP CASE. XT/AT LOOK ALIKE KEYBOARD. 150 WATT POWER SUPPLY. DUAL DISK DRIVE CARD WITH CABLES. ONE FLOPPY DRIVE DS DD 360K. A COLOR GRAPHICS CARD WITH RGB AND COMPOSITE OUTPUT. (ALL YOU NEED IS A MONITOR)

SYSTEM #3 $799.00

MOTHERBOARD WITH BIOS CONTAINING 256K OF RAM UPGRADABLE TO A FULL 640K OF RAM. FLIP TOP CASE. XT/AT LOOK ALIKE KEYBOARD. 150 WATT POWER SUPPLY. COLOR GRAPHICS CARD WITH RGB AND COMPOSITE OUTPUTS. MULTI I/O CARD WITH TWO DISK DRIVE PORTS, ONE PARALLEL PORT, ONE SERIAL PORT AND ONE SERIAL PORT OPTION, ONE GAME PORT, CLOCK AND CALENDAR WITH BATTERY BACKUP. TWO FLOPPY DISK DRIVES DS DD 360K AND A COMPOSITE MONITOR.

SHIPPING INFORMATION: PLEASE INCLUDE 10% OF ORDER FOR SHIPPING AND HANDLING CHARGES (MINIMUM $2.50, MAXIMUM $10). CANADIAN ORDERS, ADD $7.50 IN US FUNDS, MICHIGAN RESIDENTS ADD 4% SALES TAX, FOR FREE FLYER, SEND 22¢ STAMP OR SASE.

HAL-TRONIX, INC.

P.O. BOX 1101 DEPT. N
12671 DIX-TOLEDO HWY
SOUTHGATE, MICH. 48195 PHONE (313) 281-7773

HOURS: 12:00–6:00 EST Mon–Sat

DEALER FOR TEN-TEC & MFJ

"HAL"
HAROLD C. NOWLAND
W8ZXH

CIRCLE 175 ON READER SERVICE CARD

AMATEUR TELEVISION

HAMS SHOULD BE SEEN AS WELL AS HEARD!

TVC-4G 70cm ATV Downconverter
Now only $99
Delivered UPS surface in cont. USA

- See live action color & sound like broadcast TV
- Many areas have ATV Repeaters (call us or see the 87/88 ARRL Repeater Directory pg. 328 for your area)
- Most ATVers use home cameras and VCRs to show the shack, projects, home video tapes, public service events like parades, races, etc.
- Some repeaters also have weather radar, Space Shuttle video, BBS, & computer video

It's easy to start watching: 70cm antenna, a TVC-4G and any TV set tuned to ch2, 3 or 4. Our TVC-4G tunes the whole 420-450 mHz band & includes GaAsfet preamp & mixer, AC/12vdc wall plug, attractive shielded 4x2.5x7 cabinet. We also have wired & tested boards for the builder starting at $39. See ARRL Hbk chapter 20. When you are ready to try transmitting, we have transmitters, transceivers, antennas, and all your ATV needs for the 70, 33 & 23cm bands.

Hams, Call or Write for our full catalog of ATV gear!

(818) 447-4565 m-f 8am-5:30pm pst.

P.C. ELECTRONICS
2522 Paxson Ln Arcadia CA 91006

Tom (W6ORG)
Maryann (WB6YSS)

Half-Square QRV-DX Monobanders

Work DX with No Tower and No Amplifier.
Cut noise, cut near sigs, build DX sigs, kill QRM.

10 Meters	15 Meters	20 Meters	30 Meters
$29.95	$39.95	$49.95	$59.95

Broadside Pattern, Low Profile, Coax Feed, Ready to Use
Highest DX Gain per Dollar
To order add $5 Postage & Handling and call or write:

1971 North Oak Lane
Provo, UT 84604-2138 — *AntennasWest* (801) 374-1084

CIRCLE 236 ON READER SERVICE CARD

NOTCH FILTERS

SEND FOR FURTHER INFO OR $20 FOR SAMPLE. SPECIFY OUTPUT CHANNEL OF CONVERTER.

DB ELECTRONICS
PO BOX 8644
PEMBROKE PINES, FL 33084

THE 4SQTRON
ANTENNAS FROM 160–10 METERS
NEW LOCATION

NO TUNERS!
NO RADIALS!
NO RESISTORS!
NO COMPROMISE!

THREE EXCELLENT REVIEWS JUST DON'T HAPPEN BY CHANCE.
CALL US FOR A FREE CATALOG

• See review in Oct 73, 1984 • Sept 73, 1985 • March 73, 1986

BILAL COMPANY
137 Manchester Dr.
Florissant, CO 80816 PH: 719-687-0650

CIRCLE 42 ON READER SERVICE CARD

ATTENTION IBM (CLONE) AEA PK-232 OWNERS!

Send and **Receive** facsimile image pictures from your "**Video Monitor**" screen (not just your printer). Save pictures to disk. Set your computer to record FAX pictures while you are away. And lots more!

Details in the December 1987 issue of "THE SPEC-COM JOURNAL"!
Subscriptions just $20 a year (10 issues).
Signup and SASE brings software details.

THE SPEC-COM JOURNAL™
P.O. Box H, Dept. IBM
Lowden, Iowa 52255
(319) 944-5230

5%

CIRCLE 69 ON READER SERVICE CARD

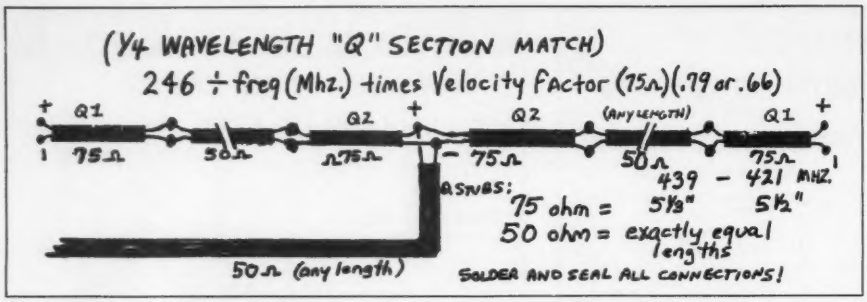


Figure 3. Details of the Q-section impedance match for W9DNT's Dual-Slot antenna.

(5 ⅛ to 5 ½ inches). The sections of 50 ohm feed can be of any length, but they must be equal to each other.

Once securely mounted, W9DNT's Dual-Slot is as rugged as any commercial antenna and performs very well.

Contact Merle and Gerald for more information. W9DNT's phone number is 309-764-1685 (afternoon and no later than 10 PM).

Gerald, by the way, is a regular on the Tuesday night ATV Users HF Network and you can talk with him or Hap WA4UMU about their designs directly. No longer can anyone say, "It can't be done." Getting the majority of the country back on the same polarization will ease existing incompatibility standard problems in many areas. Now ATV'ers can have their cake (ATV Repeaters) and set it (horizontally polarization and DX) too!

75 and 20 Meter Ham-TV Nets

The new 75 Meter 3.860 (plus 5-10 kHz) Tuesday night USATVS ATV Users Net has been in full swing for several months now! Three Net "shifts" have been established. Bill Brown WB8ELK in Findlay, Ohio, sets the established operating frequency and calls the "Early Bird" portion promptly at 8 PM (Eastern time). Hap Griffin WA4UMU of Sumter, South Carolina, takes over at 9 PM followed by yours truly WB0QCD at 10 PM. Nearly 40 net member stations check in from all parts of the country each week! Stations can be heard from New York and Pennsylvania down to the Carolinas and Virginias, over to Texas, throughout the upper Midwest and to Missouri, Nebraska, and Minnestoa to the west. Even some California stations have tried to check-in! It is just great to hear all the progress everyone is making and interest being stirred about the Ham-TV modes across the USA! Tune-in next Tuesday and say hello!

An amateur radio FAX Users Net has been established by KC0OR on Sunday afternoon at 2 PM. He should meet at 14.245 MHz where FAX operation has been suggested. A devoted SSTV'er, he is holding his nets around 14.233 MHz. Unfortunately, KC0OR ignores the League's 1987 Handbook listing, the USATVS Journal's and AEA's published 14.245 MHz recommendations. The important thing is for you FAX nuts to get together somewhere and get the hi-res mode going on transmit as well as just receiving weather pictures.

AEA's new PK-232 software package call PK-FAX is going to revolutionize FAX computer on-the-air transmissions. I will try to be on 14.245 MHz on Sundays for those of you who want to play computer FAX and exchange pictures. Don't just sit there and listen to the DX'ers. Identify and put your tones on! It will attract and demand attention!

The W1JKF/W9NTP American SSTV Users Net is still growing strong on 14.230 MHz every Saturday afternoon at 1 PM (Eastern). Brooks and Don are very conscious of 8-second, black/white, ROBOT 400 operators and replay 12-36 second color pictures in the lower resolution formats quite often. The attempt by the ailing I.V.C.A. SSTV Group to move the 14.230 MHz SSTV calling frequency to a higher spot on 20 meters failed, as it had done once before a few years ago. The DX threatens 14.230 MHz, since SSTVers are losing strength. We need to nationally publicized and declare Month of SSTV and FSTV. Now ten meters is hot again and 28.680 MHz hasn't seen too many SSTV pictures. A few years ago everybody lived on that frequency! Let's QSY and use it as well.

The USATVS sent out nearly 100 six-page letters to UHF frequency coordinators introducing them to the FSTV signal and its' characteristics, what interference can do to ATV pictures, and how intelligent frequency coordinating must be conducted for the protection of the Ham-TV modes against other users of the band. So far, we have seen fair response to our efforts. If you would like to see a copy of this correspondence and are having troubles with QRM interference, send a SASE. There is also a new QRM Interference Complaint Registration Form #2000 available (See January 1988 Spec-Com).

Don't forget to stop by and log-in to the upcoming Dayton Hamvention "ATV Workshop" sessions Friday and Saturday nights (7-11 PM) at the Ramada Inn North (I-70 and I-75). Come early to get a good seat! Bring your VCR demo tapes and photographs, too. The Dayton ATV talk channel is 147.450 MHz simplex. 73

Photo A. Gerald Cromer K4NHN, inventor of the Rib Cage Slot, makes his point.

Photo B. K4NHN (left) and N4JUR show off their Rib Cage at Dayton '87.

MAKE CIRCUIT BOARDS THE NEW, EASY WAY

WITH TEC-200 FILM

JUST 3 EASY STEPS:

- Copy circuit pattern on TEC-200 film using any plain paper copier
- Iron film on to copper clad board
- Peel off film and etch

convenient 8½ × 11 size
With Complete Instructions
SATISFACTION GUARANTEED
5 Sheets for $3.95 10 Sheets only $5.95
add $1.00 postage NY Res. add sales tax
The MEADOWLAKE Corp.
Dept. D, P.O. Box 497
Northport, New York 11768

CIRCLE 55 ON READER SERVICE CARD

THIS MONTH'S GOODIE FROM THE CANDY STORE:
ICOM ???????

UNDER
$9000.00

CD-45 II ROTATOR
$169.90 L.T.O.

OVER 8780 HAM RELATED ITEMS IN STOCK. ALL PRICES FOB PRESTON
Send SASE for HF PRICE LIST. More specials in classifieds.

ROSS DISTRIBUTING COMPANY
P.O. Box 234,78 South State Street, Preston, Idaho 83263
Telephone (208)852-0830 We Close at 2:00 on MON. & SAT.

CIRCLE 254 ON READER SERVICE CARD

Folded Broadbander
Unique folded design shortens and creates broad resonance in both bands. Length is 70' for FB 160/80 and 35' for FB 80/40. To order specify CW or SSB
Info 56c S.A.S.E.
FB 80/40 $59.95 +$5 P & H
FB 160/80 $69.95 +$5 P & H

FB Slopers
- Fast Tower Mount
- Full Legal Power
- No Caps or Coils
- Never Corrodes
- Fully Insulated
- Ready to Use
- Coax Feed
- Tough

AntennasWest
1971 N Oak Lane 1300 E
Provo, UT 84604-2138
(801) 374-1084

CIRCLE 302 ON READER SERVICE CARD

THE RF CONNECTION
"SPECIALIST IN RF CONNECTORS AND COAX"

Part No.	Description	Price
PL-259/USA	UHF Male Phenolic, USA made	$ .60
83-1SP-1050	PL-259 Phenolic, Amphenol	.85
83-822	PL-259 Teflon, Amphenol	1.50
PL-259/ST	UHF Male Silver Teflon, USA	1.50
UG-175	Reducer for RG-58	.20
UG-176	Reducer for RG-59 & MINI 8	.20
UG-21D/U	N Male RG-8, 213, 214, Amphenol	2.95
UG-21B/U	N Male RG-8, 213, 214, Kings	4.00
9913/PIN	N Male Pin for 9913, 9086, 8214 fits UG-21D/U & UG-21B/U N's	1.50
UG-21D/9913	N Male for RG-8 with 9913 Pin	3.95
UG-21B/9913	N Male for RG-8 with 9913 Pin	4.75
UG-146/U	N Male to SO-239, Teflon USA	5.00
UG-83/U	N Female to PL-259, Teflon USA	5.00

"THIS LIST REPRESENTS ONLY A FRACTION OF OUR HUGE INVENTORY"

THE R.F. CONNECTION
213 North Frederick Ave. #11
Gaithersburg, MD 20877
(301) 840-5477

PRICES DO NOT INCLUDE SHIPPING
PRICES SUBJECT TO CHANGE
VISA, MASTERCARD, ADD 4%
UPS C.O.D. ADD $2.25 PER ORDER

CIRCLE 115 ON READER SERVICE CARD

Low Prices — Low Prices
THE SPECTRUM

617 West Elk Avenue • Bemberg Center
Elizabethton, Tennessee • 37643

TENNESSEE'S NEWEST HAM STORE
"CHECK IT OUT"

This months $pecial—Paragon ..... at an unbelievable low price
Authorized Dealer For—TenTec, Astron, MFJ, and Larsen
(FOB Elizabethton)
add 5% Visa & Mastercard
$2.00 COD Fee

Call Toll Free
1-800-338-0804
Tennessee Volunteers (615) 543-5688

CIRCLE 100 ON READER SERVICE CARD

America's Best Kept Secret!
TEN-TEC
For the serious radio operator!

PARAGON HF TRANSCEIVER, MODEL 585

MEET AMERICA'S NEWEST FULL FEATURED, SYNTHESIZED TRANSCEIVER. GENERAL COVERAGE ALL MODE RECEIVER TUNES FROM 100 kHZ TO 29.999.999MHz. TRANSMIT AT 100 WATTS OUTPUT ON ALL AUTHORIZED FREQUENCIES FROM 1.8 SSB, CW, FSK AND OPTIONAL FM. NOISE BLANKER AND SPEECH PROCESSOR ARE STANDARD EQUIPMENT. DUAL VFO'S, RX OFFSET.

List $2245.00
Sale $1995.00

(LIMITED TIME ONLY)

MISSION COMMUNICATIONS
11903 Alief-Clodine Suite 500
HOUSTON, TEXAS 77082

(713) 879-7764
Telex 166872 MCON UT

MADE IN USA

CIRCLE 187 ON READER SERVICE CARD

SPECIALISTS IN FAST TURN P.C. BOARDS

PROTO TYPE P.C. BOARDS
AS LOW AS $25.00
- SINGLE & DOUBLE SIDED
- PLATE THROUGH HOLES
- TEFLON AVAILABLE
- P.C. DESIGN SERVICES

FOR MORE INFORMATION

Midland Technologies

34374 EAST FRONTAGE ROAD
BOZEMAN, MT 59715 (406) 586-1190

CIRCLE 252 ON READER SERVICE CARD

COMMODORE OWNERS!!
12 Volt C64, Vic20 mobile/portable power supplies. Take your computer on Field Day, Vacation, Anywhere!

12 V pwr supply	$42.95
1541 12 Volt mod	49.95

Add $2 postage/handling

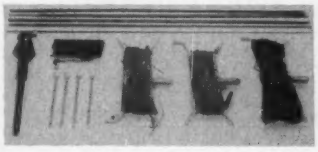
PACKET RADIO !!
C64 packet modem kits!
Includes Digicom-64, Public Domain TNC emulator disk and all parts to build packet modem.

VHF kit:	$29.95
Assembled:	79.95
VHF/HF kit:	39.95
Assembled:	89.95

DEVCOM
336 Joya Loop
Los Alamos, NM 87544
(505) 672-9742
WB5AOX Jim Devenport

CIRCLE 311 ON READER SERVICE CARD

FIELD DAY!



3 In 1 Portable Antenna Kit perfect for "field days!" Designed for 2-12 MHz operation; includes At-101-102 long-wire (#15 stranded-copper) with insulators & clips for adjusting frequency, 5-section whip with IN-127 base, plus CP-12-13 counterpoise for 15' radial groundplane. Also guys, 4-stakes, and canvas carrying bag. NATO-surplus; used-good. 22 lbs. #FD-GRC-9, ... **$49.50**

Prices F.O.B. Lima, O. • VISA, MASTERCARD Accepted.
Allow for Shipping • Write for 1988 CATALOG
Address Dept. 73 • Phone 419/227-6573

FAIR RADIO SALES
1016 E. EUREKA • Box 1105 • LIMA, OHIO • 45802

CIRCLE 75 ON READER SERVICE CARD

QSO PRO

A Easy-To-Use Logbook Program For Your MS-DOS® Compatible Computer

★ Complete Cursor Control
★ Room to store complete address information
★ A Real-Time Log
★ Total QSL's by State
★ 900 QSO's on floppy, hard disk limited by space available

$39.95*

*Ohio resident must add 5% sales tax.

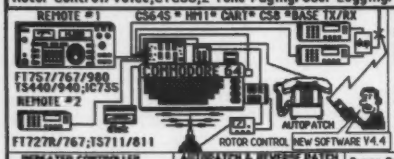
Makes Checks Payable To:
MORLAN SOFTWARE
P.O. Box 2400
East Liverpool, Ohio 43920-0400

CIRCLE 153 ON READER SERVICE CARD

*** Super Comshack 64 ***

Programable Repeater Controller/HF & VHF Remotes/Autopatch

Rotor Control/Voice;CTCSS;2 Tone Paging/User Logging/Unlimited Vocabulary



The CS64S is the most advanced control system available at any price. Total control of your ham shack/club station. Each user has individual access codes and privileges granted by the control op. All user's logged to disk &/or printer. Hi/lo priority patch & security/monitor/lock modes. Talking Packet BBS input soon.

REPEATER CONTROLLER
- *Change all variables remotely
- *Synthesized voice adj.pitch/speed
- *Program mail box or select ID tail mess. with touchtones from HT
- *Alarm clock & auto excute mode
- *Macro commands/user logging
- *Individual user access codes
- *Code practice & voice readback
- *Multifunction voice alarm clock

H.F. REMOTE #1
- *20 Macro mem/auto mode sel.
- *Scan up/down sel. rate or step
- *Voice ack. all control commands

AUTOPATCH & REVERSE PATCH
- *1000 (18 digit)tel. #'s stored
- *300 users/CTCSS & 2 tone paging
- *50 enable/disable tel.#'s
- *Individual access privilages
- *Directed/general & reverse page
- *Full or Half duplex (level cont.)
- *Security mode/ TT readback on/off
- *Store MCI/Sprint tel. #'s
- *Reverse Patch active all modes
- *Call waiting/quick dial & reset

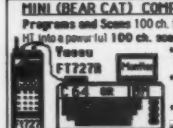
V.H.F. REMOTE #2
- *Dual VFO's/ Rev/Split/COR detect
- *Set Scan inc. & offset/ver. resume

Super Comshack CS64S $349.95 + $4.00 ship USA; incl. computer interface, disk, cables & manual (simplex version inc. on request)

SYSTEM OPTIONS
- *External Relay Control 3 DPDT relays + 5 open collector outputs..CS-8 $79.95
- *EPROM Auto boot Cartridge customized with your system .....CART $99.95
- *Beam control; speaks bearing and rotates beam ;1 degree incrs. HM1 $49.95
- *Manual (Refunded).....HM1 $15.00
- *Row & col. freq. control..RAP $149.95
- *C64 D.C. Switcher P.S. DCPS $119.95

MINI (BEAR CAT) COMPUTER CONTROL FT-727R

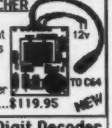
Programs and Scans 100 ch. in Ham/General coverage. Converts HT into a powerful 100 ch. scanner & programs all for field use!



- *Digital "S" meter; stops scan from S(1-9); Auto resume
- *Loads & programs all FT-727R parameters in less that 15 secs.
- *Includes hardware & disk for C64 or IBM PC

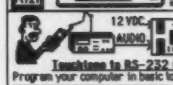
MODEL 727S $39.95

12v C64 SWITCHER



- *Draws 1.1A @12v.
- *70khz 75% efficient
- *Outputs 5v.@2 amps and 9 vac 60Hz
- *Crystal time base
- *Plugs into C64 power

MODEL DCPS.....$119.95



Touchtone to RS-232 (300 baud interface)

Program your computer in basic to decode multidigit "strings", sound alarms, observe codes...includes basic program for C64 VIC20/C128; **works on all computers!**

MODEL DAP $89.95

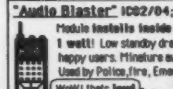
Touchtone 4 Digit Decoder & on/off latch with all 16 Digits

Expandable Repeater on/off control

- *Low power CMOS +5 to +12 Volts
- *User programable 50,000; 4 digit codes
- *Send code once to turn on, again to turn off
- *Momentary & Latch output drives relay
- *Wrong digit reset; no falsing; 2 to 4 digits
- *Mute speaker audio until call is received
- *LED displays latch state; Optional 4 digit extra custom latch,(7225) IC's $6.95 ea.
- *Model TSD $59.95

"Audio Blaster" IC02/04;2AT;U16;FT209/727;23/73R

Module **installs inside the radio** in 15 Min. Boost audio to **1 watt!** Low standby drain/Corrects low audio/1000's of happy users. Miniature audio amplifier --> Used by Police,fire, Emergency, when it needs to be **HEARD!**



NOW FOR FT78/22R OWNER

MODEL AB1-S $22.95

MODEL AB1-$19.95

ENGINEERING CONSULTING ** 583 CANDLEWOOD ST. ** BREA, CA. 92621
MASTERCARD ** VISA ** CHECK M.O. ** CA. RES. ADD 6% TEL: 714-671-2009**

DEALERS
Sell *73 Amateur Radio*

Selling *73 Amateur Radio* will make money for you. Consider the facts:

- If you carry *73 Amateur Radio* it will increase your store traffic—and our dealers tell us that *73* is the hottest selling amateur radio magazine on the newsstands today.
- Increased store traffic means increased sales for you. Hams will come into your store to pick up the latest *73* and end up buying the latest all-band, all-mode transceiver (or at least a few feet of coax).
- *73 Amateur Radio* guarantees each issue—you pay only for the copies that you sell. We pay for all shipping.

For information on selling *73 Amateur Radio*, call Peter Mandel at **800-722-7799**, or write to *73 Amateur Radio*, WGE Center, Peterborough, NH 03458.

73 Amateur Radio

WGE Center, Peterborough, NH 03458 800-722-7790

Hey LOOK!

Your Friends have been talking!

The Secret's Out!

CTM is the ham radio and computer magazine with that "down home flavor", dedicated to the practical aspects of Amateur Communications. Just starting out? You'll find our well-illustrated tutorials friendly and open; we show you how. If your interest is in High Tech, you'll find reviews and user reports of the latest thing to come down the pike and they are written so you can understand them too! If your interest is in training, you'll find articles for ham radio, computers and emergency communications.

You'll find it **ALL** in CTM

$18. year U.S. - 6 Months $10.
Mexico & Canada $32. year
Other Countries (air) $68. (Surface) $43.

There is always time for some friendly fun that you don't need a license to enjoy — and appreciate...

Are you into **Packet Radio?** Thinking about it? Then you **definitely** need CTM! During 1987 we had **65** packet and packet related articles and that doesn't even count the other **HAM** articles or the many **Computer** articles. The other four ham magazines* only had 26 packet articles during 1987. There's something for everyone in CTM! Jump right in, you'll find the natives friendly — and helpful, too!

***CQ™ 5 articles; *Ham Radio*™ 10 articles; *QST*™ 5 articles and *73*™ 6 articles = 26 articles for 1987 for the other ham magazines...**

NOW which do you need to SUBSCRIBE? CTM of course!

VISA Add 5% for credit cards MasterCard

Name:_____

Call Sign:_____

Address:_____

City:_____ ST____ ZIP_____

Phone No. (___)_____

CTM Magazine
Circulation Manager
1704 Sam Drive
Birmingham, AL 35235
(205) 854-0271

CIRCLE 11 ON READER SERVICE CARD

Number 21 on your Feedback card

BARTER 'N' BUY

QSLs To Order. Variety of styles, colors, card stock. W4BPD QSLs, PO Drawer DX, Cordova SC 29039. BNB260

The DX'ers Magazine Up-to-date, informative, interesting. Compiled and edited by Gus Browning W4BPD, DX-CC Honor Roll Certificate 2–4. Send for *free* sample and subscription information today. PO Drawer DX, Cordova SC 29039. BNB261

Xerox MemoryWriter—parts, assemblies, boards, manuals. Free help with service problems. W6NTH, Box 250, Benton AR 72015 501-776-0920. BNB404

Learn Code on your IBM-PC (or compatible) or Commodore C64/128. CODE-PRO takes you from no knowledge to proficient copy. $10 plus $2 S&H. Specify computer. TRIO TECHNOLOGY, Dept. 861, PO Box 402, Palm Bay FL 32906. BNB490

Post Card QSL Kit Converts post cards, photos to QSLs! Stamp brings circular K-K Labels, PO Box 412, Troy NY 12181-0412. BNB498

Commodore Repairs. We are the largest Authorized Service Center in the country and we repair your Commodore computer within days. (Our prices are low; eg. C64–$39.95 complete)...COMMODORE CHIPS. Authorized Distributor, Factory Fresh. #6526/6510–$9.95, #6581–$12.85, #6567–$14.75, #8701–$7.25, PLA/82S100–$13.85, 901 ROMS–$10.95 and many others. Ask about quantity discount. (WE SHIP WORLDWIDE)..."THE COMMODORE DIAGNOSTICIAN", an invaluable double sided laminated guide for fixing your C64/1541 drive. It diagnoses 72 variables and tells you what chips are faulty. $6.95 plus $1 shipping... Heavy duty C64 Power Supply $27.95 plus postage... VISA/MC... Call Toll Free 1-800-248-2983 (Nationwide) or 914-356-3131. Kasara Microsystems, Inc., 38 Murray Hill Drive, Spring Valley NY 10977. Call Toll Free 1-800-248-2983 (Nationwide) or 914-356-3131. BNB529

WRITTEN EXAMS SUPEREASY. Memory aids from psychologist/engineer cut studytime 50%. Novice, Tech, Gen: $5 each. Advanced, Extra: $10 each. Moneyback guarantee. Bahr, Dept 73-1, 2549 Temple, Palmbay FL 32905. BNB531

Ham Radio Repair, all makes, all models. Robert Hall Electronics, PO Box 8363, San Francisco CA 94128: (408)729-8200. BNB558

SB-220 Owners!—Enhance performance—add new features. 11 step-by-step mods which include: tuned-input 6- and 160-meter operation, heavy-duty power supply mods, full QSK operation, solid-state bias control, and many more. Source of parts included. One time 50% rebate for new mods submitted and two free updates. 10 pages of tech info on the 3-500Z. Order today—$10 per copy plus $1 postage. SASE for info. Bob Kozlarek WA2SQQ, 69 Memorial Place, Elmwood Park NJ 07407. BNB581

PACKET RADIO AMATEUR Announcing a new heavy duty C64 Commodore replacement power supply especially for the PACKET RADIO AMATEUR. The new higher amperage output will NOW allow for 24 hour continuous "Packet" operation without voltage change or failure which the existing unit can succumb to. This heavy duty power supply also has a heavier heat sink and is an exact physical replacement for the original unit. Over 52% of the Commodore 64 failures can be directly related to the original power supply. $27.95 plus $3 UPS shipping. Kasara Microsystems, Inc., 38 Murray Hill Drive, Spring Valley NY 10977, 1-800-248-2983 (Nationwide) or 914-356-3131. BNB587

Wanted: Lafayette PrivaCom 3C, 525, 625, or GE 5813B. RADIO, 2053 Mohave Dr., Dayton OH 45431. BNB589

MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information, write MARCO, Box 73's, Acme, PA 15610. BNB612

DX Adventure on Monserrat only $300/week. Details: Chod Harris VP2ML Box 4881-7, Santa Rosa, CA 95402. BNB618

Can you get on the **"CLASSROOM NET"**? Come to 7.238 at 1200 UTC daily or 21.395 later in the day. If you can't work WB2JKJ and the "crew" at Junior High School 22 on Manhattan's lower east side at these times we may never get to know you or receive your QSL. Don't be shut out of our QSL of the week award contest. Don't miss out on making lots of new friends and learning about the most exciting use of ham radio in education today. Send a card now via the callbook. You'll be glad you did! BNB621

COMPUTER CODE PROGRAM. New. Best value. Does everything! Free details: SASE. Bahr, Dept 73-1A, 2549 Temple, Palmbay FL 32905. BNB624

Homebrew Projects List. SASE WB2EUF, Box 708, East, Hampton, NY 11937. BNB626.

DEAD BATTERY PACK??? NiCads/Inserts/Rebuilding. Replacement inserts, less wires/plugs: ICOM BP2 $17.95, BP3(Std.) $16.95, BP5 $23.95, Kenwood: TR2400 $19.95, TR2500/2600 $24.95, Tempo; S1/270mAh $22.95, Azden; 300 $19.95, Ten-Tec; 2991 $24.95, Santec; 142/1200 W/plug $21.95, Yaesu; 207/208R $23.95, For rebuilding; Add $3 and we install inserts in ICOM and Kenwood. (Send your packs.) For others/info., SASE. In PA add 6%. Add $2 S&H/order. CUNARD ASSOCIATES, R.D. 6 Box 104, Bedford PA 15522. BNB628

R-390A Receiver: $115, electronically complete, repairable (Government-removed meters, operation unaffected). R-390A parts: Info SASE. Professional/Military quality TS-352 VoltOhm/Multimeter, AC-DC, with leads, manual: $12.50. Mint military-spec pull-out 12AT7, 6BA6, 6AG5, 6AL5: $10/six. CPRC-26 Infantry Manpack Radio, 6 meter FM, Receiver-Transmitter sections, cabinet, antenna, crystal, handset: $22.50 complete, $42.50/pair. H-251 Military Communications Headphones: $7.50. Add $4.50/piece shipping ($9 maximum), except R-390A shipped collect. Baytronics, Box 591, Sandusky OH 44870. BNB649

Amateur Radio Stamps for collectors. Israel $5. Luxembourg $1.50. Send SASE for complete list to Phil Sager WB4FDT, 126 Whiting Lane, West Hartford CT 06119. BNB651

ROSS'S $$$$ NEW SPECIALS: Kenwood TS-811A $989.90, TS-180S $689.90, TW-4100A $549.90, Alliance HD-73 $104.90, Hal CT-2100 $529.90, ST-6000 $799.90, PCI-2000 $489.90, Robot 800C $589.90, 1200C $1199.90, 450C $699.90, Drake 7000E $439.90. All L.T.O. phone or send SASE for pricing on popular items. Over 8772 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. Preston. We close at 2:00 on Saturdays and Mondays. Ross Distributing Co., P.O. Box 234, 78 South State Street, Preston ID 83263. 208-852-0830. BNB654

TEN-TEC ARGONAUT WANTED State s/n, condition, accessories. Rod Sharp N5NM, Box 2169, Santa Fe NM 87504; 505-988-2305. BNB660

ATLAS 350-XL WANTED State s/n, condition, accessories. Rod Sharp N5NM, Box 2169, Santa Fe NM 87504; 505-988-2305. BNB661

Brownies QSLs since 1939. Catalog and samples $1. (refundable with order) 3035 Lehigh Street, Allentown PA 18103. BNB662

"Hamlog" Computer Programs 17 modules. Full features. auto-logs, 7-band WAS/DXXCC. Apple $19.95. IBM, Kaypro, Tandy, C-128 $24.95. KA1AWH, PB 2015, Peabody MA 01960. BNB666

K1BV DX AWARDS DIRECTORY Complete rules for over 680 certificates, 73 countries, 170 pages $14 postpaid, Ted Melinosky, 525 Foster Street, So. Windsor CT 06074-2936. BNB672

"QSLs & RUBBER STAMPS - TOP QUALITY! States, World Maps, USA, Key, Shuttle, Globe QSLs. Report Form Rubber Stamps. More! Samples $1. (Refundable With Order). Ebbert Graphics D-7, Box 70, Westerville OH 43081" BNB675

Soldering Station and Tools European and American. Free catalog. Robert W. Mink Import-Export, Box 6437S, Fair Haven NJ 07704. 201-758-8388. BNB682

1988 PRODUCT & PRICE LIST of our KITS & ASSEMBLIES is now available. Send SASE to: A & A Engineering, 2521 W. LaPalma, Unit K, Anaheim CA 92801. BNB686

XEROX 800 Electronic Typing System technical information or schematics needed. Terry Thompson, Box 935, Dania FL 33004-0935; 305-920-1909. BNB687

Barter 'N' Buy advertising must pertain to ham radio products or services.
☐ **Individual (noncommercial)** ..... **25¢ per word**
☐ **Commercial** ..... **60¢ per word**
Prepayment required. *Count only the words in the text. Your address is free. 73* cannot verify advertising claims and cannot be held responsible for claims made by the advertiser. Liability will be limited to making any necessary corrections in the next available issue. Please print clearly or type (double-spaced).

No discounts or commissions are available. Copy must be received in Peterborough by the fifth of the second month preceding the cover date. Make checks payable to *73* Magazine and send to: Suzanne Des Rochers **Barter 'N' Buy, *73* Magazine, WGE Center, Peterborough NH 03458.**

PROPAGATION

by Jim Gray W1XU

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	14	14	7A	7	7	7	7A	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	7A	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U. S. S. R.	7A	7	7	7	7	7B	14	14	14A	14A	14	14
WEST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

ALASKA	14	14	14	7	7	7	7	7A	14	14	14	
ARGENTINA	21	14A	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14A	21A	21
ENGLAND	14	7A	7	7	7	7	7A	14	14	14	14A	14
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7A	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14	14
U. S. S. R.	7A	7	7	7	7	7B	14B	14	14A	14	14	14

WESTERN UNITED STATES TO:

ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7A	7	7	7	7B	14	21
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	21A	21
ENGLAND	14	7A	7	7	7	7	7B	7A	14	14	14	14
HAWAII	21A	14A	14	14	7A	7	7	7	14	14	21	21
INDIA	14	14	14	7A	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14A	14	14	14B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	?	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	7A	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14	14A	14	14
U. S. S. R.	7B	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.
NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

PROPAGATION FORECASTS—March 1988

Readers have shown increasing interest in radio propagation forecasting, so 73 has asked me to expound on my method of radio propagation prediction.

I prepare the forecasts approximately two months in advance in order to meet deadlines. The government provides a summary of past data for the previous week or so and also gives an estimate of expected solar behavior for the coming month. Although they give past data in great detail with much information about the sun and earth, future estimates are very general. Indeed, they have to be. Ionospheric propagation forecasting is empirical, not exact. Future trends are estimated based on thousands of past observations plus some new material developed independently and used in concert with previous data. I, and my crystal ball, reserve the right to be wrong on occasion.

MARCH

SUN	MON	TUE	WED	THU	FRI	SAT
		1 P–F	2 F	3 F	4 F–G	5 G
6 G	7 G	8 G	9 G	10 G–F	11 F	12 F–G
13 G	14 G–F	15 F–P	16 P	17 P	18 P	19 P
20 P	21 P–F	22 F	23 P–F	24 P–F	25 F–G	26 G
27 G	28 G	29 G	30 G	31 G		

BARTER 'N' BUY

Continued from page 59

CODE PROGRAMS. Apple/C-64-128. 37 Modes, Graphics, Lessons, Wrdprcsr, Menus. LARESCO, POB 2018-ST, Calumet City IL 60409. 312-891-3279. BNB689

EASY CODE By the Old Master, 90 min. Learning tape $7. 60 min. Practice tapes $6 each, any speed. Specify. Add $1 S & H. Write: The Old Master, Box 29013, Atlanta GA 30359-0013. BNB690

101 + CODE/THEORY EXAM PASSING TIPS. $2 + SASE. Bahr, Dept 73-1, 2549 Temple, Palmbay FL 32905. BNB691

CALLSIGN/NAME BADGES. Snazzy and Unique. SASE FOR PRICE LIST. BADGES. P.O.B. 637, Louisburg KS 66053. BNB693

PARTS, PARTS, PARTS, Quality Components for the Home-Brew Radio Amateur. Two F.C. Stamps for Catalog. Small Parts Center, 6818 Meese Drive, Lansing MI 48911. BNB694

Manuals for test equipment. 1000's in stock. Write for availability and price. JBM, 7061 Hagvenhurst #207B, Van Nuys CA 91406. BNB695

INDIVIDUAL PHOTOFACT FOLDERS #1 to #1400, $3. #1401 up, $5. Sams Books, $6. Postpaid. Allen Loeb, 414 Chestnut Lane, East Meadow NY 11554. BNB696

RG-214 COAX, double silver shield, .75¢/foot, WB0MPE, 1440 Lakeview Ave., Minneapolis MN 55416. 612-377-6274. BNB697

CHASSIS AND CABINET KITS SASE; K3IWK, 5120 Harmony Grove Road, Dover PA 17315. BNB698

CALL SIGN BADGES: Custom license plate holders. Personal, distinctive. Club discounts. SASE. WB3GND, Box 750, Clinton MD 20735. 301-248-7302. BNB699

WANTED: Military radios and related equipment circa WWII. Collections or single items. KA1GON, 617-396-9354 or write, 501 Mystic Valley Pkwy., Medford MA 02155. BNB700

NOVICES! 10 Meter rigs: Coverage 28.0-28.5 MHz. USB/LSB/AM. 20-25 Watts PEP $250.00. Call 609-522-1159 anytime. BNB701

WANTED: Yaesu FT690R or similar 6 meter rig in good working condition. Also, MFJ Antenna Tuner. KB8CJA, 2721 Riverview Ave., Huntington WV 25702. BNB702

MORSE CODE GENERATOR for PC/AT or compatible clones. All speeds from 1 to 35 wpm, 7 tones. Data for 720 minutes of copy at 10 wpm and file utilities supplied at no additional charge. $12, $2 S&H, Tax 7PERCENT, Dallas area 8%; RAMTRONICS, 1809 Chamberlain Dr., Carrollton TX 75007. BNB703

HAM RADIO SOFTWARE for IBMs and compatibles. "HAM-LOG" logs your QSO's, sorts and searches by call, date, etc., and prints your QSL card mailing labels. $10. "HAM-CODE" sends you random code, or type in letters from the keyboard. You select the speed and tone. $10. "HAM-AWARD" tracks your progress toward DXCC, WAS, WAC, and COUNTRY HUNTERS awards. $10. "HAM-CLOCK" displays a full color world map and gives you the time in major cities. Shows the edge of night and the time in all time zones. Color monitor required. $10. QUEST ELECTRONICS, 938 BANNOCK, DENVER CO 80204. 303-623-7700. BNB704

BUSINESS OPPORTUNITY: Profitable communications business, CB/HAM sales and services, 23 years, high return, large and faithful following, Long Island NY, Owner retiring 516-423-3614. BNB705

QUALITY QSL CARDS and rubber stamps. Send 39¢ postage or SASE for samples. New stock designs or custom cards from your black ink artwork. Sandollar Press, P.O. Box 30726, Santa Barbara CA 93130. BNB706

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette. $10. LEARN MORSE CODE IN 1 HOUR. Amazing new supereasy technique. $10. Both $17. Moneyback guarantee. Free catalog: SASE. Bahr, Dept 73-1, 2549 Temple, Palmbay FL 32905. BNB707

DRAKE TR-3 XCVR, W. P/S $365. Drake RV-3 $85; Halicrafters SR-46 6M XCVR, $50; Hitachi C.B., $10. Klaus Spies, Lock-box 48185, Niles IL 60648-0185. BNB708

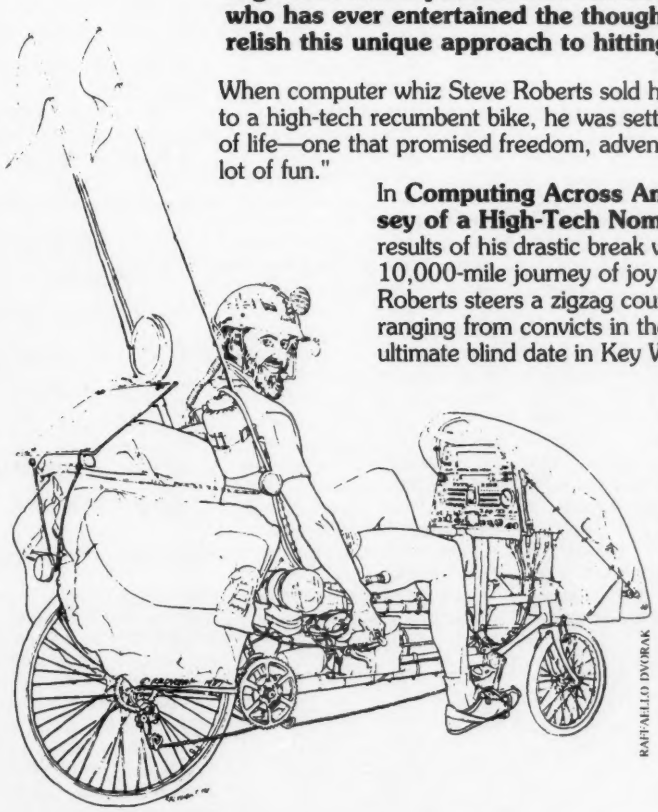
ROSS'S $$$ USED MARCH SPECIALS: Kenwood TS-700A $329.90, AT-230 $179.90, Privat Patch II $189.90, Yaesu FV-200 $109.90, FT-707 $99.90, FT-1 $1295.90, FT-980 $989.90, Hal FT-5000 $99.90, CRI-200 $169.90. Phone or send SASE for used items. Over 8772 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. Preston. We close at 2:00 Saturdays and Mondays. Ross Distributing Co., P.O. Box 234, 78 South Street, Preston ID 83263. 208-852-0830. BNB709

JUST PUBLISHED!

COMPUTING ACROSS AMERICA

by Steven K. Roberts

High-tech travel packed with fun and adventure . . . anyone who has ever entertained the thought of "just taking off" will relish this unique approach to hitting the road!



RAFFAELLO DVORAK

When computer whiz Steve Roberts sold his suburban home and moved to a high-tech recumbent bike, he was setting out to explore a new way of life—one that promised freedom, adventure, romance, and a "helluva lot of fun."

In **Computing Across America: The Bicycle Odyssey of a High-Tech Nomad**, Roberts describes the wild results of his drastic break with suburban life. It is a 10,000-mile journey of joy, despair, and self-discovery as Roberts steers a zigzag course through people and places ranging from convicts in the Maryland woods to the ultimate blind date in Key West.

Combining his wit with a strong sense about the human condition, Roberts treats the reader to a colorful cross-section of Americana, one that includes a fascinating glimpse into the social benefits of computer technology—and how it helped at least one traveler open doors to new friends, new lovers, and ultimately a new life style.

1988/368 pages/illustrated
ISBN 0-938734-18-0/softbound/$9.95
ISBN 0-938734-25-3/hardbound/$15.95

Computing Across America 730188

Publications Center 1013 Warren Avenue, Cary, NC 27511

Please enter my order for _____copies of

Computing Across America

[ ] Softcover/$9.95 [ ] Hardcover/$15.95

(Add $2.00 postage and handling to all orders.)

[ ] Payment enclosed

Name_____

Address _____

City/State/Zip_____

Telephone_____

CIRCLE 234 ON READER SERVICE CARD

AERIAL VIEW

Antenna News

Arliss Thompson W7XU
7314 SW 28th Avenue
Portland, OR 97219

Handy Yagi

Rubber ducky antennas are great, aren't they? Small and compact, they only require a couple of watts from your HT on your favorite repeater frequency, and you're in business. Unless, of course, you happen to be in a fringe area where repeater coverage is marginal. Then you may find that your signal into the repeater is inadequate to maintain reliable communications.

One possible solution is to switch to higher power, but doing so increases battery drain and, unless you have a preamp, does nothing for your receive capabilities. A longer antenna that mounts directly on your HT, such as a ½- or ⅝-wavelength antenna, can do wonders on both transmit and receive, but may still prove inadequate under some circumstances.

For instance, while I'm no mountain climber, I do enjoy day and weekend hikes to hilltops, and I like to carry my 2m handheld along with me on those excursions. Frequently I hike in fairly remote areas, and although the higher elevation of a hilltop certainly extends the range of the HT, an antenna with some gain and directivity can provide a notable increase in range.

Also, the gain can give an increase in operating time (using low rather than high power), while the directivity decreases the likelihood of bringing up two or more repeaters on the same frequency simultaneously. The antenna I use in such situations is a lightweight, 3-element Yagi that takes up a minimum of space when disassembled, yet can be readied for use in less than two minutes. It provides 6 to 7 db gain over a ½-wave dipole. Gain over a typical rubber duck is about 12 db. Read on and I'll show how to build one.

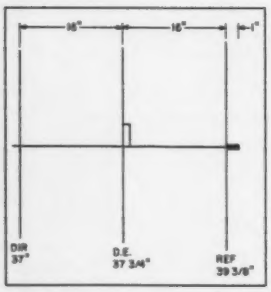


Fig. 1. Dimensions for 3-element Yagi designed for portable use on the 2-meter FM band.

Design Points

Let's first discuss the design objectives for this project, namely:

1) Good gain and directivity;
2) Light weight and compact;
3) Self-supporting;
4) Rapid assembly and disassembly;
5) Simple matching to 50-ohm coax;
6) Ready availability of materials; and
7) Easily duplicated with hand tools.

After considering a variety of possible antennas, including quads, V-beams, and other wire antennas, I settled on the 3-element Yagi mentioned above and described below. I'll leave it to you to decide how well it meets the above criteria.

Construction

Figure 1 shows the antenna in schematic form. Studying the diagrams and the photos will help the builder understand how to construct the antenna (this is another picture worth a thousand words). As for tools, I used nothing fancier than a hacksaw, a hand drill, two taps and a die. I'll admit that a drill press would make alignment of the various holes considerably easier, but this design can be replicated without much difficulty.

One of the difficulties in building a portable yagi is in how to mount the elements so that the antenna can be easily assembled and disassembled. I solved the problem by using a die to thread a portion of the ¼" solid aluminum rods used to make the elements. Assembly merely involves screwing each element half into the boom, a quick and easy procedure.

This method of mounting the elements will not work with a thin-walled hollow boom. Since a boom made of solid rod would be quite heavy, I choose to use aluminum tubing with solid rod inserts in the three areas where the elements are mounted. The boom is made from ¾" diameter, .055" wall thickness, aluminum tubing, with short lengths of ⅜" diameter solid aluminum rod serving as the inserts. The inserts are tapped both for the elements and for the 6-32 machine screws that hold them permanently in place (see Figures 2 and 3). All of these materials were purchased at the local discount building supply store.

To keep the maximum length of any portion of the disassembled antenna less than 20 inches, I cut the boom into two sections. The solid rod insert into which the driven element mounts protrudes ¾-inch from the end of the first of those sections. During assembly, the two pieces of the boom are aligned by fitting the second section of boom over the rod insert that extends from the other section. The sections are then held secure by screwing the driven element into place. See Figure 2.

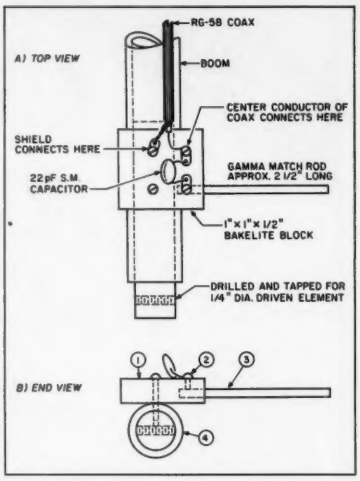


Fig. 3. Details of gamma match construction as viewed from (a) above, and (b) end on.

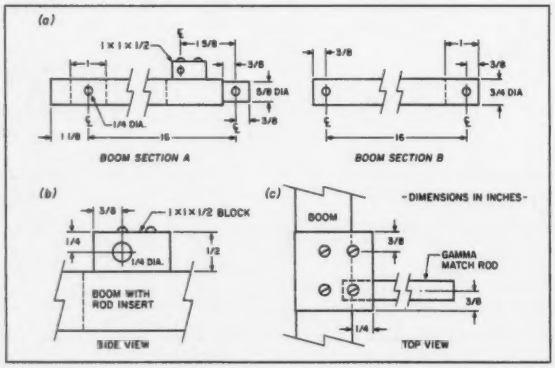


Fig. 2. Details of (a) boom, and (b and c) gamma match construction for the portable antenna.

"As a Soviet acquaintance once phrased it, 'to make talking' . . . takes less than two minutes."

*Another problem to overcome when building a portable yagi is the method of feeding the antenna. I needed a matching method that would work without having to insulate the driven element from the boom, and I hoped I wouldn't have to employ a balun. Therefore, I opted for the gamma match. The gamma rod, like the elements, is made of 1/4" diameter aluminum rod. It, too, is threaded, and screws into a 1" x 1" x ½" block of bakelite (or similar insu*lating material) that is mounted on the boom (Figure 3). The gamma capacitor is a 22 pF silver mica unit also mounted on the bakelite.

Figure 3 illustrates when the gamma rod is screwed fully into its mounting block it seats against a 6-32 machine screw situated at right angles to the rod. This pro-

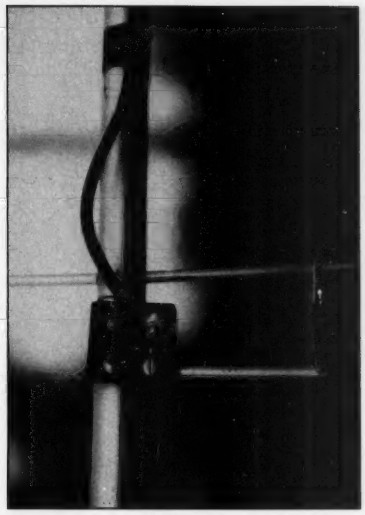


Photo A. Close-up of gamma-match assembly.

vides the necessary contact for its transmission line end. The attachment of the gamma rod to the driven element must provide good contact yet be readily assembled and disassembled. I made the connection by soldering two one-inch alligator clips end to end, as shown in Photo A.

The design criteria required the antenna to be self-supporting. The boom and elements of this antenna are obviously self-supporting, but how about the antenna as a whole? Although the antenna is lightweight, it's rather a nuisance to have to hand-hold the antenna at the midpoint of the boom while operating. Also, holding the antenna in this manner is apt to upset its pattern and adversely affect the gamma match.

To overcome this the boom extends 1" behind the reflector. One end of a ½" PVC tee coupling provides a somewhat loose but adequate fit when placed over the boom extension, with a length of ½" schedule 40 PVC pipe also fitting into the tee and serving as a mast. I used a tee rather than a 90-degree elbow, because it allowed me to use a short piece of PVC as a "handle" for the yagi (Photo B). The mast, of course, can be made from several sections of pipe using PVC couplings.

Tune Up

Tuning is simple and straightforward. Due to inevitable variations that will occur between your antenna and mine, I can only give approximate dimensions for the gamma match. However, it should be possible to compensate for any unit to unit differences by changing the position on the two alligator clips that form the gamma rod to driven element short. With the gamma rod spaced 1¾" from the driven element, and using a 22 pF gamma capacitor, I acheived a 1.1:1 SWR at 146.5 MHz with the shorting rod spaced 2¾" from the centerline of the boom.

To optimize the match between the antenna and its feedline, start with a gamma rod approximately 3" long. With the antenna in the clear and the shorting clips positioned at the end of gamma rod, measure the SWR (using only enough power to provide adequate meter deflection) at 146.5 MHz. The SWR will probably be greater than 2:1. Now in a series of ¼-inch steps, move the shorting clips closer to the boom, checking the SWR after each change of position. The SWR should be better than 1.5:1 SWR.

In the unlikely event that a satisfactory match is not obtainable, make sure the gamma rod is seated against the machine screw that serves as its contact. If that does not solve the problem, try making small changes in the value of the 22 pF gamma match capacitor.

Once a good match is obtained, either mark the correct location for placement of the short with paint or tape, or trim the gamma rod in length so a good match is achieved by placing the short at the end of the rod. See Photo A.

In the Field

Setting up the antenna in the field is very straightforward. I prefer first to align the two sections of the boom and lock them in place by screwing the two halves of the driven element into their respective holes. I then assemble the director and reflector. To avoid any confusion, I have marked the elements with small strips of tape.

With a narrow strip of tape around the boom at the director end, I know that the two element sections with a narrow strip of tape around each form the director. The elements with the wide band of tape are for the reflector, and the reflector end of the boom is similarly marked. No tape signifies the driven element. Color coding with tape or paint is another possible means of identifing the elements.

Once the elements are assembled on the boom, I screw in the gamma rod and attach the shorting clips. Then the mast is attached, the feedline connected to the radio, and I'm ready, as a Soviet acquaintance once phrased it, to "make talking." From start to finish takes less than 2 minutes,

"This design can be replicated without much difficulty."

and disassembly is just as easy. By the way, I suggest a cloth or canvas bag for carrying and storing the antenna.

Variations

The design of this antenna is based on information contained in the National Bureau of Standards Technical Note 688, as it appeared in the August 1982 issue of QST. That article provided a number of design curves allowing the antenna builder to arrive at the proper element lengths for a given frequency, element diameter, and boom diameter. Note the dimensions are based on a element mounting method that has the elements running through the boom.

Mounting the elements of above the boom or insulating the elements from the boom will probably not give a maximum gain antenna. This also applies to the dimensions provided here. Sure, the antenna may work with these dimensions and a different method of mounting the elements, but performance will probably be less than optimal. The moral here is for hassle-free contruction, do not deviate from the dimensions provided.

On the other hand, feel free to experiment. For example, I built another version of this antenna using 3.16" aluminum welding rod for elements and had good results, although the driven element and reflector lengths were each approximately ⅜" longer than when the larger diameter material mentioned above was used. I could only find the welding rod in 36" lengths so I had to purchase six rods to build the antenna, but at only 50 cents per rod the price was right. The welding rod was softer and more subject to bending than the heavier ¼" rod I used in the version described here. Since the antenna gets some rough treatment at times, I prefer the larger diameter material in this application.

That's it. For some other ideas on portable 2m gain antennas check out "Handi-antennas" in May 1983, Ham Radio, p.42, and "A portable quad for 2 meters," September 1980 QST, p.26 (with follow-up comments in June 1981 QST, p.39).

Photo B. The assembled portable Yagi in action.

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
2310 Romayor Court
Pearland TX 77581

Photo A. Six-foot TVRO system with separate azimuth and elevation control.

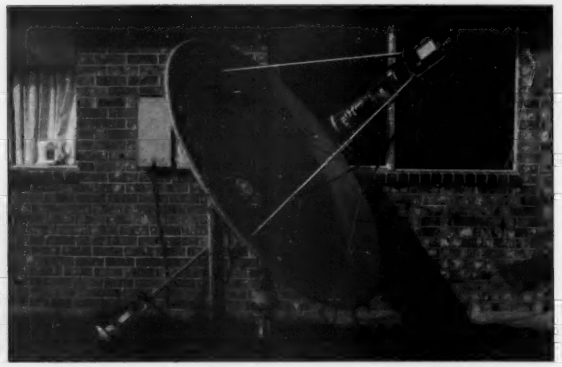


Photo B. Six-foot TVRO system with 1296 MHz "Coffee-can" feedhorn on six-foot dish.

AMSAT OSCAR 10

AMSAT-OSCAR-10 is once again into a season of declining sun angles. This means satellite chasing in the coming months won't include OSCAR-10's high orbit. However, unlike previous hibernation periods, satellite chasers can now look forward to the Phase 3C launch as an outlet for new satellite projects, antenna building, and equipment upgrading.

Phase 3C may be launched as early as this month. Time is running out to make station improvements.

Unlike most other hamsats, a Phase 3-series satellite will not be released for immediate use following launch from the Kourou Space Center. Observers need to first monitor and document satellite orbit and orientation. Then they can calculate the burn sequence necessary to inject the satellite into its final orbit. AMSAT engineers will send the orbital correction commands to the IHU (Integrated Housekeeping Unit, the computer on Phase 3C), which will execute them at the appropriate times.

How long will this take? Perhaps four weeks. AO-10 needed seven weeks, but conditions were different. AO-10 was the first Phase 3 spacecraft to achieve orbit. It was the most ambitious and complex amateur radio satellite at the time. The satellite launch team could draw from no previous experiences. The engineers had to insure the liquid-fueled kick motor worked properly since two separate burns were planned. To add to the challenge, after deployment from the launcher canister, the satellite spun in the wrong direction and suffered from low power because its solar panels were at a bad angle relative to the sun.

Is a kick motor really needed? When the Ariane upper stage deploys Phase 3C, the satellite will be in a geostationary transfer orbit (GTO) with severe limitations. The worst problem is the perigee, or low point of the orbit. The new satellite, if left alone, would last only a few months as atmospheric drag takes its toll. The first burn will correct this by raising the perigee from a few hundred kilometers to above 1000 kilometers. The second engine firing will raise the inclination (the angle of the orbit with respect to the equator) so satellite-chasers in the northern hemisphere can have better access during apogee (the orbit's highest point).

AO-10's inclination correction burn didn't occur. The first firing spent all the fuel due to a wiring error. If all goes well, Phase 3C access time will be much greater than for AO-10. (Those active on AO-10 may find this is hard to imagine.) For some, a correctly-placed Phase 3 spacecraft will give up to 20 hours a day of satellite access.

The reader can find the complete Phase 3C frequency plan in the August, 1987, Hamsats column. Four VHF/UHF bands are used in various combinations to create the various "modes" for satellite operation. Although circular polarization antennas are better for satellite work, a good set of Yagis suffices for two meters or 70 cm. The 23 cm (1269 MHz) and 13 cm (2400 MHz) bands require a higher gain antenna.

Mode L Revisited

Mode L with 1269 MHz up and 436 MHz (435 MHz for Phase 3C) isn't new, but fewer than 100 amateurs worldwide succeeded with this mode via AO-10. Due to a component failure in the L transponder, amateurs needed high-power levels to consistently access the satellite. Although 10 Watts on 1269 MHz to a six-foot dish sufficed on many occasions, it didn't work every time. Most hams didn't have the cash or time to pursue this mode.

Mode L via Phase 3C should be much easier, but inexpensive equipment is still not commonplace. A four-foot dish with a coffee-can feed system and a 10-Watt transmitter should be enough. An ICOM IC-1271A will do this nicely, but with foreign exchange-rate problems, this may not be cost-effective. All one needs is a simple transmitter or transmit converter capable of reasonable output (up to 10 Watts) between 1269.33 and 1269.58 MHz. A viable dish and feed system appears in the 1988 ARRL Handbook in the space communications chapter.

The Quest for Mode S

When Phase 3C is launched, Mode S transponder will use 70

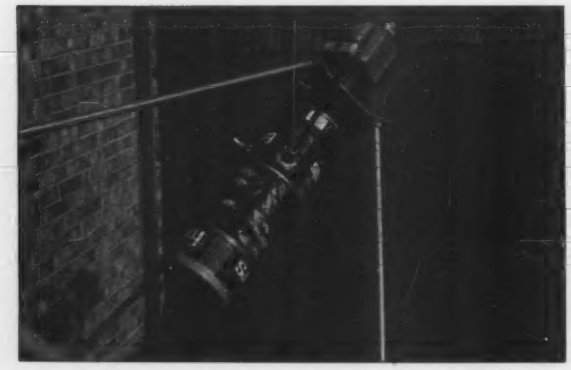


Photo C. Close-up of the coffee-can feedhorn on the six-foot dish.

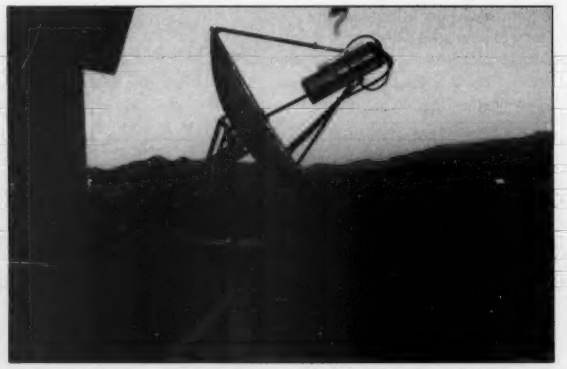


Photo D. Four-foot dish with coffee-can feed for Mode L uplink at W6ABN.

Satellite	Period (minutes)	Long. Increment (deg. W.)
U-O-9	94.12098	23.52732
U-O-11	98.54016	24.63548
F-O-12	115.65347	29.23939
RS-10/11	105.02403	26.38181

Table 1. Orbital data for low-earth orbit hamsats.

cm up and 13 cm down. At first glance, anything using frequencies above 1.3 GHz may appear unreachable. Mode S doesn't need a high-power microwave uplink. Anyone presently operating Mode B using 435 MHz up and 145 MHz down isn't far from mode S via Phase 3C. The uplink requires signals from 435.61 to 435.64 MHz. Power demands will likely be similar to Mode B, 100 to 1000 Watts ERP (Effective Radiated Power). Most antenna manufacturers make excellent crossed Yagis suitable for Mode S uplink. A station running 50 Watts at the transmitter, through 50 feet of Belden 9913 coax to a 10 dB gain antenna will have an ERP of 365 Watts.

For the downlink, a two-meter multi-mode receiver or transceiver can act as the heart of the system. From there, a low-noise receive converter that will transpose 2400 MHz to 144 MHz, and an appropriate antenna, will be necessary. The satellite's beacon will be heard on 2400.64 MHz, thus the two-meter rig would read 144.64 MHz. The transponder passband extends from 2400.695 to 2400.725 MHz.

The easiest way to get on Mode S is to buy everything. Down East Microwave of Troy, Maine, sells loop Yagi systems tuned for Mode S, along with receive converters and mast-mounted preamps. They are perhaps the only outlet offering a receive converter specifically tuned for Mode S reception. It is a modified LMW Electronics unit from England.

Home-brewers can build certain components at home. A four-foot dish with a coffee-can feed works very well used with a GaAsFET preamp. Look to the RSGB (Radio Society of Great Britain) VHF-UHF Manual and the proceedings of the 1986 Central States VHF Society Meeting to learn about using coffee-cans as feedhorns. Other excellent sources of information on 13cm gear include The UHF Compendium edited by DJ9HO, the Proceedings of Microwave Update '87 (ARRL publication) and the "13 Centimeters" column in "QEX" by Bill Olson W3HQT.

2.4 GHz Antenna System and Downconverter

Feedline loss at 2.4 GHz is serious. Locate the dish or other antenna system with the preamplifier as close as possible to the shack with a very short (10 to 20 feet) run of 9913 coax or hardline.

A surplus TVRO (satellite TV) dish is a good candidate for Mode S, but the mount needs to be adjustable in both the azimuth and elevation plane. A coffee-can feed next to an existing C-band TVRO feed works very well. Some stations used their TVRO system for Mode L uplink on AO-10 when they weren't watching locally blacked-out football games via satellite.

Set up the rest of the downconverter system in the shack. A simple converter will have a crystal-controlled local oscillator, perhaps one stage of preamplification and a mixer. Most transverters for 13 cm are designed for operation at 2304 MHz. Since Mode S uses 2400 MHz, system retuning requires a new local oscillator.

Mode S offers a new challenge. I hope to be reporting on the progress of stations here and overseas that have put the pieces together for successful Mode S operation.

More on Tracking

Interest in simple non-computer tracking methods has revived.

A reference orbit is defined as the first orbit of the day (UTC) when the satellite crosses the equator while travelling north. Information would include the date, time, and longitudinal position of this crossing.

Armed with a reference orbit, the satellite's location can be extrapolated using the period (time in minutes for a complete orbit) and the longitude increment (distance in degrees between one crossing point and the next). ■

WEATHERFAX → PC

→ Decodes AM/FM Fax Transmissions
→ Plug-In Board for IBM PC, XT, AT & Comp.
→ Display on Hercules, CGA or EGA Monitors
→ Zoom, Pan & Save Image to Disk
→ Print to Epson Compatible Printers
→ Compatible with Microsoft Paint

For More Information Write:

COMPUMAX
26 West Boylston St.
West Boylston, MA 01583

CIRCLE 80 ON READER SERVICE CARD

IRON POWDER and FERRITE PRODUCTS

AMIDON Associates

Fast, Reliable Service Since 1963

Small Orders Welcome — Free 'Tech-Data' Flyer

Toroidal Cores, Shielding Beads, Shielded Coil Forms
Ferrite Rods, Pot Cores, Baluns, Etc.

12033 OTSEGO STREET, NORTH HOLLYWOOD, CALIFORNIA 91607

CIRCLE 4 ON READER SERVICE CARD

GOES 1691 MHz RECEPTION

S-BAND CONVERTER FOR YOUR 137 MHz RECEIVER

1691-LY (N) → PREAMP MMg1691 → CONVERTER MMk 1691-137.5 → RECEIVER 137.5 MHz

1691-LY (N)	MMg 1691	MMk 1691-137.5
GAIN: 20dB	GAIN: 13dB	GAIN: 20dB TYPICAL
BOOM: 6'	N.F.: 1.2dB	N.F.: 4.8dB MAXIMUM
$86.50	12VDC @ 40 ma	12VDC @ 80 ma
	$250.00	$330.00

Send 66 ¢ (3 stamps) for detailed specs on all VHF & UHF products. Shipping FOB Concord, MA

PRICES SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

SI SPECTRUM INTERNATIONAL INC.
P.O. Box 1084S, Concord, MA 01742, USA
(617) 263-2145

CIRCLE 183 ON READER SERVICE CARD

RF POWER TRANSISTORS

We stock a full line of Motorola & Toshiba parts for amateur, marine, and business radio servicing

SEE YOU AT THE ORLANDO, CHARLOTTE & DAYTON HAMFESTS

Partial Listing of Popular Transistors

2-30 MHz 12V. (= 28V)*

P/N		Rating	Net Ea.	Match Pr.
MRF421	Q	100W	$24.00	$53.00
MRF422*		150W	36.00	78.00
MRF454,/A	Q	80W	14.50	32.00
MRF455,/A	Q	60W	11.75	26.50
MRF485*		15W	6.00	16.00
MRF492	Q	90W	16.00	35.00
SRF2072	Q	65W	12.75	28.50
SRF3662	Q	110W	24.00	53.00
SRF3775	Q	75W	13.00	29.00
SRF3795	Q	90W	15.50	34.00
SRF3800	Q	100W	17.50	38.00
2SC2290	Q	80W	16.75	39.50
2SC2879	Q	100W	22.00	48.00

Q Selected High Gain Matched Quads Available

VHF/UHF TRANSISTORS 12V.

	Rating	MHz	Net Ea.	Match Pr.
MRF245	80W	136-174	27.50	61.00
MRF247	75W	136-174	26.00	58.00
MRF248	80W	136-174	33.00	71.00
MRF641	15W	407-512	18.00	42.00
MRF644	25W	407-512	21.00	46.00
MRF645	40W	407-512	25.00	54.00
MRF648	60W	407-512	31.00	66.00
2N6080	4W	136-174	6.25	—
2N6081	15W	136-174	8.00	—
2N6082	25W	136-174	9.50	—
2N6083	30W	136-174	9.75	24.00
2N6084	40W	136-174	11.50	28.00

PARTIAL LISTING OF MISC. TRANSISTORS

MRF134	$16.00	MRF515	2.50
MRF136	21.00	MRF607	2.50
MRF137	24.00	MRF630	4.25
MRF138	35.00	MRF846	43.50
MRF174	80.00	MRF1946,A	14.00
MRF208	11.50	CD2545	16.00
MRF212	16.00	SD1278-1	17.75
MRF221	11.00	2N3553	2.29
MRF224	13.50	2N3866	1.25
MRF237	2.70	2N4427	1.25
MRF238	12.50	2N5589	7.25
MRF239	14.00	2N5590	10.00
MRF240	15.00	2N5591	13.50
MRF260	7.00	2N5641	9.50
MRF261	8.00	2N5642	13.75
MRF262	8.75	2N5643	15.00
MRF264	12.50	2N5945	10.00
MRF309	29.75	2N5946	12.00
MRF317	56.00	2SC1946,A	15.00
MRF406	12.00	2SC1947	9.75
MRF433	11.00	2SC2075	3.00
MRF449	12.50	2SC2097	28.00
MRF450	13.50	2SC2509	9.00
MRF453	15.00	2SC2640	15.00
MRF458	20.00	2SC2641	16.00
MRF475	3.00	*OUTPUT MODULES*	
MRF476	2.75	SAU4	55.00
MRF477	11.75	SAU17A	50.00
MRF479	10.00	SAV6	42.50
MRF492A	18.75	SAV7	42.50
MRF497	14.25	SAV15	48.00
40582	7.50	M57712, M57733	use SAV7
NE41137	2.50	M57737, SC1019	

Hi-Gain, Matched, and Selected Parts Available

We stock RF Power transistors for Atlas, KLM, Collins, Yaesu, Kenwood, Cubic, Mirage, Motorola, Heathkit, Regency, Johnson, Icom, Drake, TWC, Wilson, GE, etc. Cross-reference on CD, PT, SD, SRF, JO, and 2SC P/Ns.

Quantity Pricing Available Foreign Orders Accepted

Shipping/Handling $5.00 COD / VISA / MC

Orders received by 1 PM PST shipped UPS same day. Next day UPS delivery available

ORDER DESK ONLY — NO TECHNICAL

(800) 854-1927

ORDER LINE and/or TECH HELP

(619) 744-0728

FAX (619) 744-1943

RF PARTS

1320 Grand Avenue
San Marcos, CA 92069

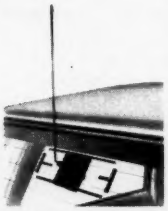
Look at our MOBILE MARK™ "ON WINDOW" Line

PATENTED

VHF (140-175)
- *No Hole*
- *Easy to Mount*
- *Rugged*
- *Superior Performance*
- *Radiator Snaps On and Off*
- *Competitively Priced*

UHF (420-520)
- *3 db gain*
- *No Hole*
- *Easy to Mount*
- *Rugged*
- *Superior Performance*
- *Radiator Snaps On and Off*
- *Competitively Priced*

Cellular/Trunking (800-895 MHz)
- *3db Gain*
- *No Hole*
- *Easy to Mount*
- *Rugged - Goes through Car Wash Without Removal*
- *Superior Performance*
- *Broad Bandwidth*
- *Small Size*
- *Competitively Priced*



MOBILE MARK, INC
COMMUNICATIONS ANTENNAS

3900-B River Road
Schiller Park, IL 60176
312-671-6690

brings imagination and innovation to antennas ..... and has been since 1948 !!

CIRCLE 163 ON READER SERVICE CARD

Factory-less, jumper-less, ROM-less programming.

With the new **S-COM 5K** Repeater Controller, you'll be able to configure your repeater remotely — using DTMF commands. Only the **5K** offers this capability for just $189, wired and tested.

- Easy to interface
- Polite ID'er
- Nonvolatile Memory
- Needs only 55 mA/12 V
- Adjustable Audio
- CMOS Microprocessor
- DTMF Muting
- Control Receiver Port
- 65 control commands
- Programmable Command Strings
- Optional Audio Delay
- Optional Rack Cabinet

S-COM INDUSTRIES

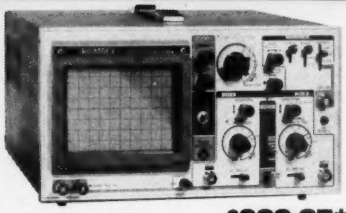
S-COM Industries
P.O. Box 8921
Fort Collins, CO 80525
(303) 493-8316

CIRCLE 95 ON READER SERVICE CARD

RAMSEY

RAMSEY ELECTRONICS

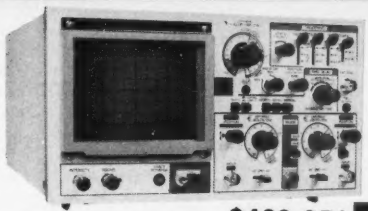
QUALITY TEST GEAR YOU CAN COUNT ON



INCLUDES 2 HOOK-ON PROBES **$369.95***

20 MHz DUAL TRACE

Features component testing circuit for resistors, capacitors, digital circuits and diodes—TV sync filter—high sensitivity—Z axis—XY mode—built-in calibrator—5X horizontal magnifier



INCLUDES 2 HOOK-ON PROBES **$469.95*** SALE

35 MHz DUAL TRACE

wide frequency bandwidth—optimal sensitivity —delayed triggering sweep—hold off—ALT trigger—single sweep TV sync 5X magnification—XY or XYZ operation— HF, LF noise reduction

NEW COM-3.

$2495.00* THE COMMUNICATIONS SERVICE MONITOR THAT WORKS HARDER FOR LESS.

Introducing COM-3... the new service monitor designed by service technicians for service technicians. It works harder for less... giving you advanced testing capabilities at a very affordable price.

FEATURES • Direct entry keyboard with programmable memory • Audio & transmitter frequency counter • LED bar graph frequency/error deviation display • 0.1-10,000 μv output levels • High receive sensitivity, less than 5 μv • 100 KHz to 999.9995 MHz Continuous frequency coverage • Transmit protection, up to 100 watts • CTS tone encoder, 1 KHz and external modulation

UNSURPASSED QUALITY • SUITABLE FOR HOBBY, SERVICE & PRODUCTION

MODEL	BAND WIDTH	# TRACES	CRT SIZE	VERTICAL SENSITIVITY	MAXIMUM TRIG FREQ	USEABLE MAXIMUM BANDWIDTH
2200	20 MHz	(2)	8x10CM	5 mV per div	35 MHz	30 MHz
3500	35 MHz	(2)	8x10CM	1 mV per div	50 MHz	60 MHz

All include high quality 1:1, 10:1 hook on probes, instruction/service manual with schematic and component layout. 1 year warranty.

*Add an additional $10.00 for each unit for shipping.

MINI-100 COUNTER

$119.95 CHARGER, NICAD BATTERIES, AC ADAPTER INCLUDED

CT-70 7 DIGIT 525 MHz

$139.95 WIRED, INCLUDES AC ADAPTER

CT-90 9 DIGIT 600 MHz

$169.95 WIRED INCLUDES AC ADAPTER

CT-50 8 DIGIT 600 MHz

$189.95 WIRED INCLUDES AC ADAPTER

CT-125 9 DIGIT 1.2 GHz

$189.95 WIRED INCLUDES AC ADAPTER

MODEL	FREQ RANGE	SENSITIVITY	ACCURACY	DIGITS	RESOLUTION	PRICE
MINI-100	1-500 MHz	Less than 250mv	1 PPM	7	100 Hz, 1 KHz	119.95
CT-70	20 Hz-550 MHz	< 50mv To 150 MHz < 150mv To 600 MHz	1 PPM	7	1Hz, 10Hz, 100Hz	139.95
CT-90	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 MHz	1 PPM	9	0.1Hz, 1Hz, 10Hz	169.95
CT-50	5 Hz-600 MHz	LESS THAN 25 mv	1 PPM	8	1Hz, 10Hz	189.95
CT-125	10 Hz-1.25 GHz	< 25mv @ 50 MHz < 15mv @ 500 MHz < 100 mv @ 800 MHz	1 PPM	9	0.1Hz, 1Hz, 10Hz	189.95
CT-90 WITH OY-1 OPTION	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 MHz	0.1 PPM	9	0.1Hz, 1Hz, 10Hz	229.90

RAMSEY FREQUENCY COUNTERS

Ramsey Electronics has been manufacturing electronic test gear for over 10 years and is recognized for lab quality products at breakthrough prices. Our frequency counters have features and capabilities of counters costing twice as much.

RAMSEY D-4100 COMPACT DIGITAL MULTITESTER

$24.95 test leads and battery included

PRICE CUT

Compact sized reliability and accuracy. This LCD digital multitester easily fits in your pocket, you can take it anywhere. It features full overload protection • 3½ digit LCD readout • recessed input jacks • safety probes • diode check function • 2000 hours battery life

RAMSEY D-5100 HANDHELD DIGITAL AUTORANGING METER

$44.95 Includes Probes 1 Year Warranty

Provides distinctive audible chirp after contact has been made and meter reading has stabilized. Has TOUCH-HOLD feature to allow readings to be logged or referred to before making the next reading. Up to 10 AMP current capability and a continuity function which beeps on zero Ohms.

$49.95 wired includes AC adapter

PR-2 kit $39.95

PR-2 COUNTER PREAMP

The PR-2 is ideal for measuring weak signals from 10 to 1,000 MHz • flat 25 db gain • BNC connectors • great for sniffing RF • ideal receiver/TV preamp

$69.95 wired

PS-2 kit $49.95

PS-2 AUDIO MULTIPLIER

The PS-2 is handy for high resolution audio resolution measurements, multiplies Up in frequency • great for PL tone measurements • multiples by 10 or 100 • 0.01 Hz resolution & built-in signal preamp/conditioner

$89.95 wired includes AC adapter

PS-10B 1 GHz PRESCALER

Extends the range of your present counter to 1 GHz • 2 stage preamp • divide by 1000 circuitry • super sensitive (50 mV typical) • BNC connectors • 1 GHz in, 1 MHz out • drives any counter

MINI KITS—EASY TO ASSEMBLE—FUN TO USE—FOR BEGINNERS, STUDENTS AND PROS

TONE DECODER
A complete tone decoder on a single PC board. Features: 400-5000 Hz adjustable range via 20 turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.

Complete kit, TD-1 **$5.95**

40 WATT 2 mtr PWR AMP
Simple Class C power amp features 8 times power gain 1 W in for 8 out, 2 W in for 15 out, 5 W in for 40 W out. Max output of 50 W, incredible value, complete with all parts, less case and T-R relay.

PA-1, 40 W pwr amp kit **$22.95**

TR-1, RF sensed T-R relay kit **6.95**

COLOR ORGAN
See music come alive! 3 different lights flicker with music. One light each for, high, mid-range and lows. Each individually adjustable and drives up to 300 W. runs on 110VAC.

ML-1 Kit, **$8.95**

VOICE ACTIVATED SWITCH
Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED or even a tape recorder motor. Runs on 9 VDC.

VS-1 KIT **$6.95**

VIDEO MODULATOR
Converts any TV to video monitor. Super stable, tunable over ch 4-6. Runs on 5-15V accepts std. video signal. Best unit on the market! Complete kit, VD-1 **$7.95**

LED BLINKY KIT
Alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights. Runs on 3 to 15 volts.

BL-1 Kit, **$2.95**

MAD BLASTER
Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC

MB-1 Kit **$4.95**

UNIVERSAL TIMER
Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.

UT-5 Kit **$5.95**

WHISPER LIGHT
An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC.

WL-1 Kit **$6.95**

FM WIRELESS MIKE
Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.

FM-1 Kit **$3.95**

FM-2 Kit **$4.95**

SIREN
Produces upward and downward wail, 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker.

Complete kit, SM-3 **$2.95**

SUPER SLEUTH
A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker.

BN-9 Kit **$5.95**

60 Hz TIME BASE
Runs on 5-15 VDC. Low current (25ma) 1 min/month accuracy

TB-6 Kit **$5.50**

TB-6 Assy **$9.95**

TELEPHONE TRANSMITTER
Low cost with professional performance. Features include: self phone line powered, tunable from 76 to 100 MHz, polarity antisensitive, compact size (½" x 1¼"), easily installs anywhere on the phone line or inside the instrument itself.

PB-1 KIT **$14.95**

FM RECEIVER
For built-in applications or hobby experimentation. Full fledged superhetodyne receiver, microvolt sensitivity, 10.7 MHz IF, Integrated Circuit detector, 50 mw audio amplifier, 9V external power source, operation on standard FM broadcast band as well as large portions on each side, compact (6" square), for bug detection or reception

FR-1 KIT **$14.95**

FM MINI MIKE
A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available.

FM-3 Kit **$14.95**

FM-3 Wired and Tested **19.95**

ACCESSORIES FOR RAMSEY COUNTERS

Telescopic whip antenna—BNC plug	$ 8.95
High impedance probe, light loading	16.95
Low pass probe, audio use	16.95
Direct probe, general purpose use	13.95
Tilt bail, for CT-70, 90, 125	3.95

VISA MasterCard

PHONE ORDERS CALL 716-586-3950

TELEX 466735 RAMSEY CI

FAX 716-586-4754

TERMS • quantities guaranteed • warranty for 10 days, if not pleased, return in original form for refund • add 5% for shipping and insurance to a maximum of $10.00 • foreign add 15% for surface mail • COD add $2.50 (COD in USA only) • orders under $15.00 add $1.50 • NY residents add 7% sales tax • 90 day parts warranty on all kits • 1 year parts & labor warranty on all wired units.

RAMSEY ELECTRONICS, INC.
2575 Baird Rd.
Penfield, N.Y. 14526

CIRCLE 34 ON READER SERVICE CARD

Number 25 on your Feedback card

SPECIAL EVENTS

Ham Doings Across the Country

Special Events listings will be provided by 73 Magazine *free of charge on a space-available basis. Announcements must be received by us by the first of the month, two months prior to the month in which the event takes place (by March 1, for example, for a May or later event). Please mail to Editorial Offices,* 73 Magazine, *WGE Center, Peterborough NH 03458. ATTN: Special Events*

PLAINWELL MI
MAR 4–6

The Second Annual State Technical Institute Electronics Communications Seminar and Hamfest weekend will be held on March 4, 5 and 6, on the school grounds at 33 Alber Drive. CET and NABER Examinations will be administered on Friday, March 4th Technical seminars will be conducted on Saturday, March 5th.The Hamfest will be from 8 AM to 3 PM. Admission is $2, and tables are $4 and $6. Talk-in on 146.46 Simplex and 224.28/224.68 (State Tech Repeater). Flea market, distributors' displays, VE examinations, campus and Electronics Department tours. For more information and table reservation write to: *Philip Schmitt WA8JXE, State Technical Institute, 33 Alber Drive, Plainwell MI 49080; or call the school at 616-664-4461.*

WASHINGTON TX
MAR 4–6

The Brenham A.R.C. will operate a Special Events Station from Washington-on-the-Brazos State Park Beginning 0000Z March 4 until 0000Z March 6, to commemorate the 152nd Anniversary of the Signing of the Texas Declaration of Independence from Mexico. Frequencies: phone, CW and Packet–VHF, UHF and HF 10 thru 80 meters, including the 10 Meter Novice phone band. For a commemorative QSL, send a legal size SASE to: *BARC, P.O. Box 44, Brenham TX 77833.*

CHICOPEE MA
MAR 6

Mount Tom Amateur Repeater Association Annual Fleamarket will be held Sunday, March 6 at the Knights of Columbus. There will be computer, electronic and Amateur vendors. Tables are $8 in advance, $10 at the door. Doors open to vendors at 7 AM, and open to the public at 9 AM. Admission is $2, and your non-ham spouse and children under 12 are free. Talk-in on 146.94 and 223.82 repeaters, 146.52 simplex. Walk-in Amateur exams for all classes at 10 AM. Applicants must bring check for $4.35 payable to ARRL/VEC, positive ID, original and photocopy of Amateur License and any interim certificates. For reservations write: *Marvin Yale N1CDR, 6 Laurel Terrace, Westfield MA 01085; 413-562-1027 eves, or days 413-532-6411 or 413-532-4891.*

CONNEAUT OH
MAR 6

The Conneaut Amateur Radio Club would like to announce their upcoming Hamfest. It will be held at the Conneaut Human Resource Center, on March 6. There will be exams, food, and prizes. Wheelchair acc. Check in on 7.39/99. Doors open for vendors at 7 AM and for the public at 9 AM to 3 PM. Admission is $3. Eight foot tables are available for $5. For more information contact: *Jack Marttila KA8TUU, 697 Broad St., Conneaut OH 44030.*

YORK PA
MAR 6

The First Annual York Winterfest (Ham and Computer) will be held Sunday, March 6 at the Dover Firehall. Two floors indoor tables and free tailgating. Food, refreshments and prizes. Inside tables $10. Registration is $4. XYL free. Blacktop parking. General admission is at 8 AM. Talk-in on 146.37/97 and 147.93/33. Advanced info and registration: *York Winterfest, 2449 Heidlersburg Road, Gettysburg PA 17325.*

ST. LOUIS MO
MAR 11

On Friday night March 11, the Jefferson Barracks Amateur Radio Club will be holding our 28th annual ham radio auction. The location again this year will be the Concordia Turners Hall. The auction has always been the kick-off of the hamfest season and over 800 people attend. For more information write to: *Jefferson Barracks Amateur Radio Club, c/o Carl H. Hohenberger WB0BZP, 5266 Parker Ave., St. Louis MO 63139.*

AUGUSTA ME
MAR 12–18

The Augusta Emergency Amateur Radio Unit will operate from the state capital using the special Bicentennial call sign, W200TLC, From 0001Z March 12 until 2359Z March 18. Operating will be on all bands and modes 160 meters through 70 cm. For special QSL card, send QSL and SASE to: *W1TLC, Augusta Emergency Amateur Radio Unit, c/o K1NIT, William Crowley, Box 1589, Hallowell ME 04347.*

APPLETON WI
MAR 12

The Fox Cities Amateur Radio Club will sponsor "Swapfest 88" at Appleton East High School, on March 12. Tables $5 (by reservation only). Doors open for sellers at 6 AM, for others at 8 AM. For table reservations or other information contact: *Don Baker NB9J, 621 West 7th St., Kaukauna WI 54130; 414-766-3886.*

CAVE CITY KY
MAR 12

The annual Glasgow Swapfest will be held at the Cave City Convention Center, on March 12. The Swapfest will start at 8 AM Central time and continue until everyone goes home. Admission is $3 per person, tables available at $3 each. Misc. forums will be held along with an excellent flea market. Talk-in on 146.34/94 and 147.63/.03. Additional information from: *N4HCO, 1379 White Chapel Road, Glasgow KY 42141.*

EGG HARBOR CITY NJ
MAR 12

The Shore Points Amateur Radio Club invites everyone to its "Springfest '88" hamfest, to be held on Saturday March 12, starting at 9 AM (sellers may arrive at 7 AM to set up) at the Atlantic County 4-H Center. 8000 square feet of heated indoor selling space is available, with additional space for outdoor tailgating, weather permitting. Limited AC available in indoor space. Sellers: $5 per space (supply of tables limited, request if needed); buyers: $3. Talk-in on 146.385/.985 and 146.52 simplex. For more information write to: *SPARC, P.O. Box 142, Absecon NJ 08201.*

INDIANAPOLIS IN
MAR 13

The Indiana Hamfest will be held on March 13. Open to the public at 8 AM. Sponsored by the Morgan County Repeater Association. Held indoors with 60,000 square feet of space at the Indiana State Fairgrounds Pavilion Building. VEC Exams and Ladies Programs. Admission: $5 at the door. Eight foot flea market table (including space) $8 each. No Space without table will be sold. Advanced reservations requested–Tables sold out in 1987. Setup: Saturday, March 12, 3-9 PM. Sunday, March 13, 6-8 AM. Free paved parking. Talk-in on 145.25. For table reservations or information send SASE to: *Aileen Scales KC9YA, 3142 Market Place, Bloomington IN 47401; 812-339-4446.*

VALHALLA NY
MAR 13

The 1988 ARRL Hudson Division Convention will be held in conjuction with the WECAFEST '88 hamfest on Sunday, March 13, at the Westchester Community College. The convention is jointly sponsored by the Hudson Amateur Radio Council (HARC), the Westchester Emergency Communications Association (WECA) and WARY-FM, the college's radio station. The one-day event will be packed with activities, including new ham forums, ARRL workshops, a gaint flea market, FCC Exams and more! Admission is $4 at the door. Talk-in on 147.06, 146.91, 224.40 MHz repeaters. For exhibitor/vendor information, please contact: *Bob or Sarah Wilson by phone at 914-997-8491, or by mail at 2 Soundview Ave., White Plains NY 10606.* For general information, contact: *Program Chairman Rich Moseson NW2L, at 201-680-1585, or write "The Great '88," c/o NW2L, 19 Linden Ave., Bloomfield NJ 07003.*

DUBLIN IRELAND
MAR 17

On St. Patrick's Day, March 17, there will be a most ambitious undertaking, from an amateur radio viewpoint, an attempt to be made to contact the many other towns or cities named Dublin around the globe. (It is estimated that there are over 20) using not only SSB but also with the help of Pre- arranged skeds to attempt to make visual contact in a world-wide amateur slow-scan TV link-up. The Lord Mayor of Dublin, The Right Honourable Carmencita Hederman has agreed if at all possible to partake in the exchanging of St. Patrick's Day greetings with these other Dublins. This station again with the special call sign will be located in Dublin Ireland's main thoroughfare of O'Connell St. It is hoped to relay live SSTV pictures from the front window of a prestigious department store to the public outside. The station will be active on HF for the day. For more information contact: *Shane Halpin, D.M.A.R.C., 25 Knocknashee, Goatstown, Dublin 14.*

CHARLOTTE NC
MAR 19–20

The Mecklenburg Amateur Radio Society is pleased to sponsor the Charlotte Hamfest and Computerfair, an ARRL Sanctioned Hamfest, to be held on March 19 and 20. It will be held at the Charlotte Convention Center. Open Satuday 9 AM to 5 PM, Sunday 9 Am to 3 PM. There will be 150 commercial exhibit booths and over 500 flea market tables. All of the major manufacturers and dealers will be there. All indoors, 87,00 square feet. There will also be plenty of programs and forums, and license exams by the Charlotte VEC on March 20. In addition to hourly gifts. Talk-in on W4BFB/r on 145.29

(-600). The tickets are $5 in advance, $6 at the door, tables are $10 in advance, $12 at the door. Children under 12 free. Tickets and tables are good for both days. Reservations and inquiries may be made by writing: *Charlotte Hamfest, P.O. Box 221136, Charlotte NC 28222-1136*.

FORT WALTON BEACH FL
MAR 19–20

Playground Amateur Radio Club (PARC) will be holding it's 18th annual Ham/Swapfest on Saturday, March 19 from 8 AM to 4 PM and Sunday, March 20 from 8 AM to 3 PM. For more information write to: *PARC Ham/Swapfest, P.O. Box 873, Fort Walton Beach FL 32549*.

MIDLAND TX
MAR 19–20

The Midland Amateur Radio Club will hold its annual St. Patrick's Day Swapfest on Saturday, March 19, at 10 AM to 5 PM and Sunday, March 20, at 8 AM to 2:30 PM at the Midland County Exhibit Building. Preregistration is $5, $6 at the door. Tables are $6 each. Refreshments and food available Volunteer Examiner tests for all categories given. For futher information and reservations, please contact: *Midland Amateur Radio Club, P.O. Box 4401, Midland TX 79704*.

PISCATAWAY NJ
MAR 19–20

The Piscataway ARC will operate a special event station on March 19 and 20 from 0000Z to 2400Z each day, to commemorate the WWII operations of the Voice of America Relay station, WRCA. Members will operate under their own callsign, and sign /VOA. Suggested frequencies are: CW, Novice portions of the bands. Phone, the lower third of the general portion of the bands on 75, 40, 20 and 15 meters and the Novice program on the 10 Meter band. For certificate send #10 or for unfolded a 9"x 12" SASE, with your QSL to the *KO2K* callbook address.

HUDSON NH
MAR 19

The Interstate Repeater Society of The Derry Repeaters, will hold its annual flea market on Saturday March 19th, at the Hudson, NH Lion's Club Hall. Doors open at 8 AM and close at 4 PM admission is $2. Talk-in on the Derry 146.85 and 224.46 MHz Repeaters. Tables are $10 which includes two admissions. Some tables have 110 volt power available. Featured will be Ham equipment and parts as well as computers and components. For table reservations write to: *IRS, P.O. Box 693, Derry NH 03038; 603-434-4435*.

MARSHALL MI
MAR 19

The 27th Annual Michigan Crossroads Hamfest will be held on March 19 at the Marshall High School. This event is sponsored by the Southern Michigan Amateur Radio Society and the Marshall High Photo Electronics Club. Advanced tickets are $2 (SASE) and $3 at the door. Table reservations are .50cents per foot (min. 4 ft). Reserved until 8 AM. Talk-in on 146.66 or 146.52 or 223.94. Send SASE to: *SMARS, P.O. Box 934, Battle Creek MI 49016; or call Wes Chaney N8BDM at 616-979-3433*.

STERLING IL
MAR 20

The Sterling-Rock Falls ARS 28th Annual Hamfest will be held at the Sterling High School. There will be commercial distributor, dealers, a large flea market and camping space. ARRL VE testing. Tickets are $3 advance, $4 at the door. Tables are $5 including electricity. Talk-in on 146.25/85. Testing information write to: *Jim Buikema NR9G, 512 North Genesee St., Mossison IL 61270. Or call 815-772-7874*. For more information about tables or tickets, contact: *Sue Peters, P.O. Box 521, Sterling IL 61081; 815-625-9262*.

WEST HARTFORD CT
MAR 20

The Insurance City Repeater Club annual Amateur Radio and Computer Flea Market will be on March 20. It will be at The American School for the Deaf at 9 AM to 2 PM. Talk-in on 146.28/88. Tables are $10 and admission is $2. For more information contact: *Chuck Motes K1DFS, 22 Woodside Lane, Plainville CT 06062; 203-747-6377 evenings*.

TIMONIUM MD
MAR 26–27

The 1988 greater Baltimore Hamboree and Computerfest will be held on march 26th and 27th at the Maryland State Fairgrounds Exhibition Complex. It is opening at 8 AM to 5 PM on Saturday and 8 AM to 4 PM on Sunday. Admission is $4 or $6 for both days, 12 and under free. For more information and reservations, contact: *GBH&C, P.O. Box 95, Timonium MD 21093-0095; or call 301-HAM-FEST*.

ELIZABETHTOWN KY
MAR 26

The Lincoln Trail Amateur Radio Club's Hamfest Committee would like to announce that the Kentucky ARRL State Convention will be held at Pritchard Community Center, on Saturday March 26. Talk-in on 146.52 and 146.38/98. ARRL VE walk-in testing and numerous forums. Admission $4 advanced, $5 at the door. Vendor spaces $5 each plus ticket. For advanced tickets and set-up reservations and information on exams contact: *Chuck Strain AA4ZD, P.O. Box 342, Vine Grove KY 40175*.

MOORHEAD MN
MAR 26

The Red River Amateurs are once again pleased to sponsor the HOBBIE HI-TECH 1988. It will take place at the Ramada Inn, on March 26. There will be a large indoor flea market and several commercial exhibits. Also seminars and a special recognition lunch for those involved with the Barnsville Digipeator/Repeator. There will be a regular VE Test held in the morning. Talk-in is on 146.76. For more information please call or write: *Tim Gooding ND0YX, 1006 Sheyenne St., West Fargo ND 58078; 701-282-6630*.

UNCASVILLE CT
MAR 26

The Second Annual Radio Amateur Society of Norwich (RASON) Auction will be held on March 26 at the VFW Hall, at 9 AM; Auction from 10 AM until sold out. Admission is free and there will be food available. Bring your equipment to be auctioned. Talk-in on 146.13/73. Call *KY1F* at 203-536-0187 for further information.

GRAYSLAKE IL
MAR 27

The Libertyville and Mundelein Amateur Radio Society is pleased to announce the Lamarsfest 1988. It will be held on Sunday, March 27 at the Lake County Fairgrounds. Doors open at 8 AM and close at 2 PM, setup is at 6 AM. Admission is $2 advance (by 3/18), or $3 at the door. There will be a large indoor electronic and radio swapfest, commercial exhibitors, code speed testing, and prizes. Talk-in is on 147.63/.03, Waukegan repeater 146.52 simplex. For more information please contact: *Lamars, c/o Marc Abramson, P.O. Box 751, Libertyville IL 60048*.

JEFFERSON WI
MAR 27

The Tri-County Amateur Radio Club W9MQB, will hold its Annual Hamfest on Sunday, March 27, from 8 AM to 3 PM, at the Jefferson County Fairgrounds. Tickets are $2.50 in advance, $3 at the door. Tables are $3 in advance, $4 at the door. Reserve early, we sell out early. Amateur exams will be provided from 10:30 AM to 1:30 PM. Doors open at 7 AM for sellers only. Talk-in on 144.89/145.49 or 146.52. For more information, tickets or tables, send SASE to: *TCARC, P.O. Box 321, Milton WI 53563*.

MADISON OH
MAR 27

Never Say Die

Continued from page 6

Then there's the long overdue need to stop funding three branches of the military and meld it all into one single service. With modern transportation and communications, the differences between land, sea and air are narrowing. With one service we might be able to save hundreds of billions of dollars by eliminating the vested interests in obsolete weapons. And isn't it time we changed the name of the Department of Defense to the Peace Department? Heck, it used to be the War Department.

I don't want this to expand to a book—and that's what it would take to go into the many changes we need to get America back to #1 in the world. Making sure that every youngster in America understands electronics and developing a million young hams in the process won't hurt. Perhaps we'll be able then to do more with digital voice and TV communications via amateur radio. We're so far behind the times right now it's pathetic. I don't think we're going to be able to catch up unless we get kids coming back into our hobby.

So, if it makes you feel superior, be my guest and call me crazy. But remember, I've been doing my homework, so I'm ready to explain any of my proposals you think won't work. I'm also wide open for any ideas you may have on ways to get America back to #1. Also, isn't it about time we elected an actual working vice president? Perhaps if we cut a couple cabinet positions and put the vice president in charge of making America #1....?

I don't know if my ideas make sense to you, but the groups I've addressed all seem convinced they would work—and we critically need someone to get our country going again. I've talked with several of the presidential candidates—and listened to the others. Sigh. I sure wish one of them would steal my platform. I'm a businessman, not a politician, so I'd like to see our country run more like a business.

"Try a MAXCOM®..... it will put a smile on your face too"

VSWR 1.5:1 OR LESS

AUTOMATIC ANTENNA MATCHER
FOR ALL S.S.B. RADIOS
"ONE ANTENNA 100 KHZ. TO 200 MHZ."

MAXCOM® has made Global Communications Simple!!!

From $299.

For FREE information, call Sonny at (305) 527-5172 or write:

P.O. Box 502 Ft. Lauderdale, FL. 33302

®MAXCOM is a registered trademark and is owned by Maxcom Electronics, Inc.

THE BOTTOM LINE: "MAXCOM®WORKS"

CIRCLE 101 ON READER SERVICE CA

»»»TS-940S OWNERS«««

ONLY USING 10 MEMORIES?
HATE THAT HIDDEN BANK SWITCH?

THE BANKER lets you access all 40 memories from the front panel!

*Just press the "VOICE" button to step through all banks
*Board just plugs in- no modifications to your rig!
*Installs and removes in minutes, just like the optional voice synthesizer board
*Takes no power from backup batteries
*1-year warranty

Note: THE BANKER cannot be used if you have the optional voice synthesizer board installed.

Send check or money order for $49.95 to:
Inventron Labs
P.O. Box 1882
Brookline, MA 02146

CIRCLE 61 ON READER SERVICE CARD

Multiband QRV 160-10 Emergency Pack

Field Day Winner

The Emergency Pack contains QRV 160-10 All Band kink-proof weather sealed antenna, Quick Launch kit, 70' RG-8x feedline, 160 meter adapter, all band counterpoise, 200' rotproof line. Complete and QRV. One person installs in 15 minutes.

Fastest Antenna in the West

$139.95
+$10 P.& H.
incl 47 page Tech Manual
Info: 56c s.a.s.e.

1971 N. Oak Lane 1300 E.
Provo, UT 84604-2138

AntennasWest
(801) 374-1084

CIRCLE 90 ON READER SERVICE CARD

* * NEW * *

"I learned all of my code and theory while driving to and from work, it was easy."

If you don't have time to read books & take notes at home for the theory exams or spend hours copying code practice you can learn them by simply listening at your leisure. You will learn not only the exact questions and answers on your test but the **detailed theory** behind each one. You will thoroughly understand what you are being asked and why the answer is correct.

New Novice, New Technician/General, Advanced, Extra.

Theory courses on audio cassettes. $19.95 ea.

Learn code non stop all the way from scratch through Novice to Extra class speed (0 to 23 words per minute) with one course. Code is learned at a high rate with wide spacing between characters. A completely structured course which will take you in easy steps to your license class speed. Simply listen at your leisure.

Code course on audio cassettes. $19.95

VEC type code General or Extra Exam tape C90 $7.95 ea.

Shipping 3.00 per theory or code course. Exam tapes $1.00. Check, MO, Visa or MC. Courses shipped same day received.

AMATEUR RADIO SCHOOL KB6MT
Jerry Ziliak KB6MT (7 years instructing students)
2350 Rosalia Drive, Dept. B, Fullerton, CA 92635
(714) 990-8442

CIRCLE 288 ON READER SERVICE CARD

VISA ICOM MasterCard

VHF COMMUNICATIONS

INTRODUCING W2DRZ
VHF/UHF MODULES. NOW AVAILABLE
A 4 STAGE SEQUENCER
INTRODUCTORY PRICE $34 PREPAID
DEALER INQUIRIES INVITED
ICOM, AEA, LARSEN, VAN GORDEN, VIBROPLEX, NYE-VIKING, FALCON COMM, LEADING EDGE, ARRL PUBLICATIONS, KAGLO, HAMTRONICS, PROWRITER, ELEPHANT DISKS, DEBCO, TRIONYX

915 North Main Street
Jamestown, New York 14701

Western New York's finest... amateur radio dealer!
PH. (716)664-6345

CIRCLE 298 ON READER SERVICE CARD

. . . at last . . .
your shack organized!

A beautiful piece of furniture – your XYL will love it!

$199.50 S-F RADIO DESK
Deluxe - Ready to Assemble

Designed with **angled** rear shelf for your viewing comfort and ease of operation.

FINISHES: Walnut or Teak Stain.
Floor Space: 39" Wide by 30" Deep
Additional Information on Request.
Checks, Money Orders, BankAmericard and Master Charge Accepted.
F.O.B. Culver City. (In Calif. Add 6% Sales Tax.)
DEALER INQUIRIES INVITED

Radio equipment not included

Also Available . . . .
Floor Space: 51" Wide by 30" Deep
$219.95

S-F Amateur Radio Services
4384 KEYSTONE AVENUE • CULVER CITY, CALIF. 90230 — PHONE (213) 837-4870

CIRCLE 73 ON READER SERVICE CARD

8-POLE CRYSTAL FILTER

For **Kenwood** , **ICOM** and **Yaesu** products. We will match any competitive prices. **FREE** one year subscription for ICOM, Kenwood or Yaesu Newsletter ($10.00 value) with filter purchase. USA only. For latest prices, call (305) 879-6868 or send SASE for latest catalog!!

We also offer **expert repair service** on Kenwood, ICOM, Yaesu,, Azden and Atlas equipment. 15 years experience, **5 days** average turnaround time. Call for more info!!

INTERNATIONAL RADIO, INC.
751 S. Macedo Blvd.
Port St. Lucie, FL 34983
(305)879-6868

CIRCLE 97 ON READER SERVICE CARD

THE EXPERT'S EDGE

HELP AT LAST FOR

Computerizing Radios:
Faster Operation, Instant QSY's and Mode Control
Contesting:
Faster QSO's, Integrated Terminal, and Radio Operation
Digital Operators:
Novice to Extra

FEATURES

— Computerized radio and terminal control
— Menu driven choice selection
— 40 function keys
— Pop-up Menus
— Split screens, color windows show speeds & frequencies
— Keyboard radio frequency control
— 5000 bytes memory keyer with automatic transmit, receive transitions

SUPPORTED EQUIPMENT

Radios	Terminal Units	Computers
Kenwood TS-940 TS-440, TS-711, TS-811	AEA PK 232 Pakratt™ Kantronics KAM Heathkit HK-232	IBM PC & Clones, PS/2 Color or Monochrome 320K Free Ram 1 Serial Port Per Controller/Device 2 Disc Drives

EXPERTQ
10245 Leatherwood (817) 249-7410 Fort Worth, Texas 76108

CIRCLE 249 ON READER SERVICE CARD

CB-TO-10 METERS

We specialize in CB radio modification plans and hardware. Frequency and FM conversion kits, repair books, plans, high-performance accessories. Over 12 years of satisfied customers! Catalog $2.

CBC INTERNATIONAL
P.O. BOX 31500X, PHOENIX, AZ 85046

Multiband QRV Dipole/V/Sloper

Ready to Use
Fastest Install
Coax Feed
2500 V Insul

Tough
Flexible
Kink-Proof

Full Legal Power
No Lossy Traps
Low Noise
Never Corrodes

QRV-80-10 $49.95 31 ft. long
QRV-160-10 $59.95 102 ft. long

Prices include 47 page Tech Manual. To order add $5 Post & Handling.

1971 N. Oak Ln.
Provo, UT 84604

Info: 56c s.a.s.e.

AntennasWest
(801) 374-1084

CIRCLE 303 ON READER SERVICE CARD

T.V.I. problems?

Low pass T.V.I. filters from Barker & Williamson

FL10/1500 FL6/1500 FL10/100 FL6/100

Model	Power (Watts)	Cut Off Frequency	Frequency of Maximum Attenuation	Minimum Attenuation	Frequency Range	Price
FL10/1500	1000	34 MHz	52 MHz	70 db	1.8 - 30 MHz	$32.00*
FL10/100	100	44 MHz	57 MHz	60 db	1.8 - 30 MHz	$23.50*
FL6/1500	1000	55 MHz	63 MHz	70 db	6 meter	$38.00*
FL6/100	100	55 MHz	63 MHz	50 db	6 meter	$27.00*

All above to match 50 ohm transmitters and antennas.

*Add $2 shipping and handling

ALL OUR PRODUCTS MADE IN USA

BW **BARKER & WILLIAMSON**

Quality Communication Products Since 1932
At your Distributors. Write or Call
10 Canal Street, Bristol PA 19007
(215) 788-5581

CIRCLE 53 ON READER SERVICE CARD

DOCKING BOOSTER

Converts Your HT to a Powerful Mobile Unit

•Kenwood
•Yaesu

NEW! DUAL BANDER FOR FT727

NAVAL ELECTRONICS, INC.
5417 Jetview Circle • Tampa, FL 33614
Phone: 813-885-6091 • Telex: 289-237 (NAVL UR)

CIRCLE 151 ON READER SERVICE CARD

Hi Pro Repeaters MELCO

MAGGIORE ELECTRONIC LAB

Manufacturers of Quality Communications Equipment

- •Repeaters
- •Links
- •Remote Base
- •VHF,UHF
- •Receivers
- •Transmitters
- •Antennas

- •Standard and Computerized Controllers
- •Standard and Computerized Auto Patches
- •Duplexers

Hi Pro 'E' EXPANDABLE REPEATER SYSTEM

• A NEW CONCEPT IN REPEATER DESIGN, THE Hi Pro "E" IS AN EXPANDABLE REPEATER WITH THE FOLLOWING FEATURES: A BASIC REPEATER WHICH WOULD INCLUDE A COMPLETE RECEIVER, TRANSMITTER, COR, FRONT PANEL CONTROLS AND INDICATORS, LOCAL SPEAKER AND MIC JACK AND CAPABLE OF FUTURE EXPANSION. ALL HOUSED IN AN EXTREMELY RUGGED, ENCLOSED, 19-INCH RACK MOUNTABLE CABINET.

• THIS SYSTEM CAN BE EXPANDED AT TIME OF PURCHASE OR CAN BE AN AFTER-PURCHASE ADD ON. THE ADD ONS ARE—HIGHER POWER, 110/220 VAC POWER SUPPLY, IDENTIFIER, AUTO PATCH, OR COMPUTER CONTROLLERS. IN ADDITION TO THESE ADD ONS AN ADDITIONAL RECEIVER AND TRANSMITTER CAN BE MOUNTED INTERNALLY FOR USE AS CONTROL LINKS, REMOTE BASE OR DUAL BAND OPERATION, ETC.

• AN EXTENSION PANEL IS AVAILABLE FOR LOCAL MONITORING OF THE REPEATER AND CONTAINS ALL NECESSARY METERING, STATUS LIGHTS AND INDICATORS. ALL ADD ONS ARE AVAILABLE FROM THE COMPANY AND ARE COMPLETE INCLUDING INSTRUCTIONS.

MAGGIORE ELECTRONIC LAB.
600 Westtown Rd. West Chester, PA 19382 Phone (215) 436-6051 Telex 499 0741 MELCO

WRITE OR CALL FOR OUR COMPLETE CATALOG

CIRCLE 47 ON READER SERVICE CARD

QRP

Number 26 on your Feedback card

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

ON TOROIDS

No doubt you check for the next QRP project to build when the mailman brings the latest ham magazine to your door. Every now and then there's a real dandy. Looking it over, you find it covers five bands, has LCD frequency display, and uses nothing but 555 timer chips and 2N2222 transistors. Looking deeper into the circuit, you find that the designer used toroids. *Oh, no!* Look at T3—24 turns of trifilar wire wound at 8 turns per inch over a T-60 core. Watch polarity. Well forget this mess, I don't know how to wind a simple single layer toroid, let alone a beast like that.

Fear not—this month we look at toroids, and how to wind them, including those nasty trifilar jobs.

The Why of Toroids

Toroids give an exceptionally large amount of Q in a very small mass. This makes the toroid ideal for miniaturization. A toroid inductor is self-shielding. Its core contains nearly all the magnetic flux. There's minimum interaction between tuned stages by using inductors wound on a toroid, which allows toroid placement physically close to other components.

This includes the chassis and other metal parts. Because the toroid core contains within it the magnetic flux, there is tighter coupling between windings, as the case of a secondary winding over a primary winding.

Most cores are highly permeable because they contain ferrite material. This lets the designer use fewer turns in the tuned circuit toroid. Fewer turns mean the designer can use larger gauge wire. This reduces I^2R losses. This is very helpful where transistor collector currents are very high.

Toroids are doughnut-shaped coils. Toroids, like doughnuts, come in different flavors and sizes. They contain either powdered iron or ferrite. Toroids are made with a special type of ceramic.

There are no simple rules in core material selection in circuit design. Many factors are considered, such as operation frequency, and the core's physical size and permeability. The higher the permeability, the fewer turns required for a given circuit Q.

An RF choke in the transistor PA collector requires a low I2R loss, which means fewer turns of the core. This translates to a high-permeability core. Most designers need not worry about what core to use in a given circuit. Most of the letters I receive ask not what core to use, but how to wind those blasted things. If a designer needs to know what core to use for what frequency, Amidon Associates will send him all the needed data. It's free. Write for it.

Collect the required cores before soldering anything together. Sometimes it requires sending off an order via the mail for the required cores. It's awfully frustrating to wait for the proper cores to arrive to finish a project. When you send in your order, be sure to order more than needed. Add them to the parts bin for future needs. Go together with a buddy or club and get the bulk discount.

A Practical Example

Examples of these cores are in the Two-Fer filter. The filter requires one T-50-2 core. We want to build the 40-meter filter. There are, of course, several different winding methods. I find the following method best.

The toroid needs 14 turns of #24 wire on the core. Since the T-50-2 is a rather large core, I hold it in my left hand and wind with the right. Leave a good amount of wire for the lead—about three inches—and trim later. How much wire to start with? Well, that's a tricky one. Fourteen turns translate to about a foot of wire (with margin). Always use a lot of wire when winding unknown coils. Nothing is worse than running out of wire before the coil is done. There are tables to determine how much wire is needed for how many turns.

Stick the wire through the core and, with one finger of your left hand holding it, take your right hand, and feed the wire back through the core. That makes turn number one. Continue winding the core in this manner until you hit 14 turns. Again, leave a good long lead to work with. The ends of the windings should be somewhere in the neighborhood of 20–30° apart from each other. This reduces and distributes the capacitance of the windings.

Now spread out the core windings as evenly as possible. The windings may be wound all together, but they must have an even distribution around the coil when finished.

Removing Wire Enamel

When the windings are in place, scrape the enamel off the wire in order to solder the toroid coil to the PC board. Here are several methods that have worked for me:

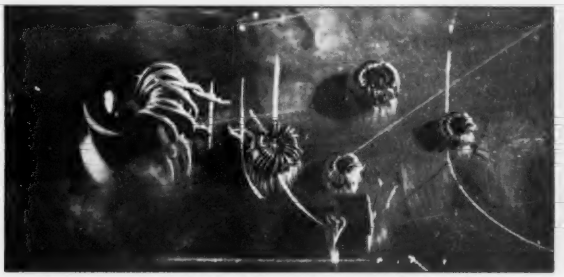
- Hold the core in one hand and pull the wire between a piece of sandpaper or emery to remove the enamel. Don't pull too hard, or the wire will stretch and possibly break.
- Let the toroid core hang over a table top and, with one lead held between a piece of sandpaper and the table top, roll the coil back and forth, removing the enamel. Again, be careful, or the wire lead will twist off.
- Scrape the enamel off with an X-acto knife. This is the fastest and most dangerous method. Those knifes are verysharp. Too much pressure will nick or cut through the wire. A nicked wire will break later.
- This last method works only on wire with certain types of enamel coating. Get a small metal cup (e.g. a spray can lid) and pour in semi-gell paint remover. Mount the toroid coil on a small square of perf-board and let the wire leads sit in the paint remover.

Next mount the toroid coil to the PC board. I stand the coils upright on the PC board. Sometimes I use a drop or two of super glue to hold the core in place. This keeps the coil from flopping around and prevents lead break-off. If the coils are intended for, say, a VFO, use silicone sealer to hold and cover the coils. This keeps the coils from moving and changing the VFO frequency. A good source of silicone sealer is bathtub caulk. A $3 tube lasts for years of building.

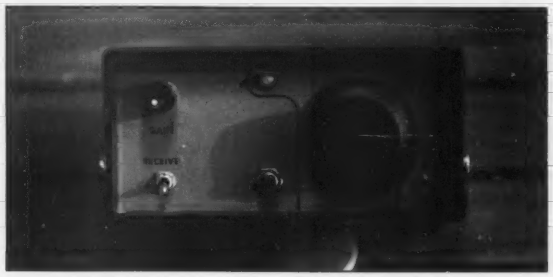
Trifilar Coils

There is nothing magical about winding these coils. Use the same procedure as for the single wire coils. The tricky part is getting the three wires wound together. This requires several things before starting: the wire, a file cabinet, a hand drill or hand egg beater, and a couple of minutes of time.

I like to twist about three to five



Save time and money by winding your own coils.



This receiver was a snap with home wound toroids.

"There is nothing magical about winding (trifilar) coils."

feet of wire at a time. I use what I need, mark the rest and return them to the junkbox. Start by wrapping one end of the wire to the file cabinet handle. Almost anything can anchor the the wire, but file cabinet handles work best.

With an eye screw in the bit of the hand drill, pass the wire through the eye and back to the file handle. One more time loop the wire through to the eye hook in the drill bit. This gives three runs of wire between the drill and the file cabinet. Now start twisting the wire together. Use the hand drill and turn the handle to twist the wires. Keep turning the handle for a nice even twist. Don't worry about that "eight turns per inch" stuff for what we are doing. Don't twist the wire so tightly as to cause the wire to knot up. Cut the wire from both the file cabinet handle and the drill bit. The result is a length of tri-wound wire.

In the absence of a hand drill, use a hand-powered egg beater. Use a variable speed electric only with great care. A bent six-penny nail can be used for the eye screw.

One, Two, Three

To finish winding the coil, start by placing six inches of wire through the core. Wind the proper amount of wire on the core and leave another six inches of wire on the other end.

Separate the three wires from each end of the coil. Remove the enamel from all six leads. Now, with the help of a trusty VOM, attach one test lead to one wire. Find the other end of this wire. (VOM set for ohms, R x 1) Cut both ends down to four inches. Go to the next lead and find its mate. Cut both these leads to three inches. Of course, the last wire pair will be the third coil. Cut both these leads down to two inches long. Now all three wires have been identified and marked. The longer wire is number one. Next longer wire is number two, and the last wire is number three. Still with me?

Now to take care of those phasing dots. With the leads identified, the coils can easily be phased together. Mark on the schematic phasing dots 1, 2, and 3. Their order isn't critical, but I usually mark the top dot 1, next one down as 2 and so on. Since the longest wire is dot number 1, I can play connect the dot!

Dot 1 goes to Q3 base, Dot 2 connects to the other end of Wire one. End of wire 2 goes to Q4 base. Simple. Using this method will really take the scare out of those trifilar coils.

That takes care of toroid winding. Practice winding coils on different cores. I have a good stock of pre-wound coils in the part bins. I wind more turns that I will need, and later on when I do need a coil, I just remove the unneeded turns. This really saves time when experimenting on different circuits.

That's all this month. Again, I ask for photographs of your stations, projects, or anything QRP-related that you want to send along. Stock up the junk box—we will be doing some receiver building this year.

QRP CONTEST RECORD SET

Danny Eskenazi K7SS shattered without question the world record score for single operator, QRP class in CQ magazine's SSB contest last October. While operating an ICOM IC-735, Danny's 3200 contacts gave him an initial score of over 3,000,000. TG9GI held the previous QRP record score of 1,035,683 since 1982.

Danny operated from friends' home in Curacao (PJ). Citing the IC-735's compact size, he said, "I had a complete QRP DXpedition station in a box! I took extra microphones, clocks, coaxial cable, a backup power supply, wire pencils, coffee, and vitamin C, but only one radio. . . I knew that's all I would need." He also used a digital voice keyer, boom headset, and a Cushcraft TH-6 antenna at 70 feet. He considers his best contact KH6CC in Hawaii on 160 meters!

Although big gun multi-multi stations PJ1B and P40V combined to work more than 30,000 contacts, Danny proved that five watts from a great radio and a determined operator can work wonders. He plans to return to Curacao next year.

Thanks ICOM America.

INDEX: March 1988

Number 40 on your Feedback card

10 meters 14,22,47,77,86,99
160 meters 74
220 MHz 39,48,86,99
7910 World Chip 77
Advanced 9,86
AEA 81
Allford Slot antenna 54
Amidon Associates 73
Amiga 81
AMSAT 64,85
AMTOR 81
Antenna Compendium 26
AO-10 64,65
Apple 81,86
Ariane 94
ARRL Handbook 20,22
Assembler 86
backscatter 86
Baluns 27
Bangladesh 90
basic 9,86,102
battery pack 12,31
Becky Niemela 47
Belgium 91
Belrose 32
Big Wheels 54
Binary Phase Shift Keying 77
Bird Wattmeter 31
BNC connector 26
BPSK 77,78
Canada 20,90,102
CARF/CRRL/DOC Symposium 102
CCITT 78
China 90,91
Civil Air Patrol 37
CoCo 81
Com-Rad Industries 31
Commodore 86
Commodore 64 48
Compuserve 81
Computing Across America 13
Creative Design Co Ltd 16
Crossed Dipoles 54
CW keyboards 86
Dayton 37,56,85,102,103
Dayton Hamvention 37,85
Delphi 81
Delta-match 15
diode switching 20
Dodge Colt 31
Doppler DFs 37
Down East Microwave 11
Dual band watch 47
dual noise blanker 47
dummy load 31
DX nets 86,100
DXpedition 35,74,85,102
Earth-Moon-Earth 4,91
Electron Processing Inc 47
epitaxial 27
EQ curve 77
equalization 77,78
ERP 85
feed-lines 34
Fox-hunting 37
FSK 77,78
FT-727DX 31
Fuji-OSCAR-12 65
FUN! Poll 86,103
G3JVL 11
G6JP, GR Jessop 76
G8AZM 11
GaAsFET 31,65,75,76
gamma match 15,62,63
general 9,86,103
GEnie network 13
Great Britain 65,90
GTO 64
Halos 54
Hustler RX-series antennas 48
IARN 102
IBM 86,102
IC-3AT 99
IC-781 47,48
IF amplifier 76
IHU 64
IMD 32
Integrated Housekeeping Unit 64
jammers 38,39,86
KA1HY, Bryan Hastings 4,9,31
Kantronics 77,81
Kaypro 81
KE5ZW, Paul Gilbert 9
Kenwood TM-2530A 28
Kenwood TR-2500 26
Kenwood TS-130S 26
KL7YV, Mike Rice 78
KLM 22,35
Kourou 64
Kowalski, Ray 9
LA2GV 85
LAN 91
Larsen Electronics 85
League 27,91,102
Malta 90
Maxcom 200D 42,44
Maxcom Inc 42
Maxcom XLD-150 42
meteor scatter 4,22,91
MFJ 22,48
Minimum Shift Keying 77
Mir 91
Mode K 65
Mode L 64,65
Mode S 65
Moonbounce 4
Morse code 50,99,103
MS-DOS 81
N4HY, Bob McGwier 78
N4RH, Ralph Haller 9
NA5E, Larry Ledlow 102,103
Naval Electronics 31
NBFM 77,78
New England DXCC Dinner 85
No-code 103
North Korea 91
Novice 9,86,103
Novice Enhancement 91,99,103
OAR 37
OH2BH 85
Orion Hi-Tech 16
OS-9 81
OSCAR 64
OSCAR 1 64
OSCAR 10 64
Oscarlocator 65
Pac-Comm 13
Pascal 86
PC-XT 81
PCs 78
Perseids 22
Peter I island 85
PHASE 3 64,65
Phase 3C 64,65
Phenix, Richard 90
PK-232 56,81
Plantronics headset 13
preamplifiers 75,76
QMODEM 81
QST 13,42,44,63,81,102
Radio Electronics 9
Radio Frequency Interference 27
Reach 27,28,34,78
RF choke 73
Rib Cage slotted antenna 56
RIT 47
RSGB 26,65,76
RTTY 47,48,77,81,86,101
SB-200 20
SO-239 connectors 42
Southern Cal DX Club 85
Southwestern Bell 9
spectrum analyzer 48
sporadic E 4,91
Squalos 54
SSB Electronics LT-33S 11
stubby-duck 26
technician 9,86,103
telegrams 50
Telegrapher 50
Ten-Tec Corsair II 99
The Cleveland Hamnet 102
The DX Bulletin 100,102
The Technology Dictionary 27
Tiare Publications 47
toroid 44,73,74
Toshiba S-AU3 31
traffic handling 86
Transmission Line Tranformers 27
TransPolar ski trek 102
transverter 11,76
tropospheric wave 4
TV 14,15,47,54,65,90
two meters 12,28,32,64,91,103
United Kingdom 103
United States 50,100,101
Untenna 31,32
UOSAT-OSCAR-9 65
VE1SH, Ron Hessler 102
vertical antennas 32
VI88XPO 90
Vic-20 48
Visalia 85
VOM 74
VP2ML, Chod Harris 85
VSWR 16,32,35,42,47
W3FQJ, Edward Noll 47
W3HQT, Bill Olson 65
W3IWI, Tom Clark 78
W5YI, Fred Maia 103
W6GO, Jay O'Brien 102
W6ZH, Pete Hoover 99
W7PHO, Bill Bennett 9
W7XU, Arliss Thompson 26,32,42,62
W9DXCC Meeting 85
WA3AJR, Marc I Leavey MD 81
WA4DSY, Dale Hetherington 77
WA5ZIB, Andy MacAllister 64
WAS nets 102
WB6RQN, Brian Lloyd 77
WB8VGE, Mike Bryce 73
Webster 100
WEFAX 48
Western Union 50
World Systems Engineering 31
WWV 22,81
XP800 Expert MSX 81
XR-2211 77
Yaesu 290 13
Yankee Clipper Contest Club 85
Harada 28
RSGB 76
twin passband 47

ABOVE AND BEYOND

VHF and UHF Operation

Pete Putman KT2B3353
Fieldstone Dr.
Doylestown PA 18901

To Mast-Mount or Not to Mast-Mount

Thinking of spending a few hundred dollars and installing a mast-mounted preamplifier for one or more VHF/UHF bands? Read on.

What Transmission Line?

The contemporary VHF operator can choose from a wealth of transmission lines. He can equip a station with everything from inexpensive RG-58/U-size cable all the way up to ½", ⅞" and 1 ⅝" hardline—even flexible waveguide, if he can afford it! However, much of hamdom must compromise between cost and performance. . . and cost usually wins.

Belden 9913 is a relatively inexpensive cable that has made it much easier for new hams to be active on the higher frequency bands with modest power. Belden 9913 has its limitations, such as its remarkable ability to absorb water if not properly waterproofed, but there's no debating its excellent low-loss characteristics, especially at 432–1296 MHz. Half-inch hardline retails at over $1 per foot, and ⅞" line at over $3. Belden 9913 looks very attractive at under .50/foot.

Since my cable runs are fairly short (65 feet or less), I've put 9913 into service on every band except 50 MHz and 2304 MHz. (On 6 meters, 8214 foam is more than adequate at about 1.5-dB loss per 100 feet. On 2304, I've used a 35' piece of Heliax with 9913 pigtails to a loop yagi.)

Based on portable contest observations and tests performed here, it appears that, for most stations:

- running 500 watts or less;
- on 432 MHz and below; and
- with up to 100 foot cable runs

Belden 9913 is the best balance between cost and performance—provided the operator installs the connectors properly and the line is completely waterproofed. At power levels above 500 Watts (depending on frequency) the line may flash over, especially when moisture is present. Feedline losses start to pile up, too, with lengths over 100 feet.

Don't Spend Yet

A mast-mounted preamp probably isn't necessary if a station system fits within the above parameters. Most of today's amateur VHF equipment uses low-noise, high-gain devices in the front-end and mixer stages that easily overcome modest line losses.

Stacking antennas is another easy way to improve the overall gain of a system. Consider that transmission line losses at 432 MHz with 9913 amount to 2.5 dB per 100 foot run. This can be made up just by stacking two matched yagis.

Configuring a Preamp

If the operator must run extremely long feedlines above 144 MHz, a mast-mounted preamp helps. It's best to use two separate lines with a single SPDT relay at the antenna. Low-loss cable such as ½" or ⅞" hardline is used for the transmit leg, while a length of 9913 or even 8124 can be used on the receive leg, with the preamp situated just after the relay. This scheme offers a great degree of protection, since the relay is usually wired "hot" during receive. When power is switched off, the preamp is out of the line.

Using two feedlines as above allows best use of the typical "hot" GaAsFET preamplifier, which usually has too much gain to be put just ahead of the receive converter or multimode down in the shack. For example, suppose a ham uses an ICOM IC-475A, which has about .15μV sensitivity for 10 dB S/N ratio and a 1-dB compression point of +4 dBm. Putting an 18 to 20 dB gain preamp without a 50Ω pad just ahead of the radio will likely degrade overall receiver performance.

Installing the same preamp at the head end of a 100 foot run of 8214 cable makes more sense. If the preamp has 20 dB of gain and the feedline has 4 dB of loss, there is 16 dB net gain at the shack. This brings the .15 μV signal up almost 3 S-units. The preamp will also appreciate operating into something that looks like a smooth 50Ω load, and the chances of oscillation are reduced if not eliminated.

One particular operator used ⅞" hardline with mast-mounted preamplifiers and eventually brought all of them back into the shack. In this instance, the feedline lengths were all under 125 feet, and the added gain wasn't worth the additional trouble of a sequencer, extra DC control lines and repeated failures at critical times. The operator found that most of the signals he heard were at least 10 dB out of the quiescent band noise, and installing the preamplifiers in the station with an appropriate 50Ω pad worked almost as well.

Additional improvements were made with the installation of stacked 4-bay arrays where one yagi was used previously. At 432 MHz, this more than made up the losses incurred in the feedline by a factor of 3. This was a very practical solution. ⅞" hardline typically exhibits losses of 1 to 1.25 dB per 100 foot run. Stacking another yagi would in effect cancel out the losses in a 200 to 250 foot run of

CONFIGURATION #1

Element	Type	Gain
Antenna	23 element yagi	18 dB
Feedline	RG8/U poly coax, 100 ft.	-10 dB

With a signal of 10 dB S/N at the antenna feedpoint, it will be 0 dB S/N at the 1296 Mhz receiver (at threshold noise level).

CONFIGURATION #2

Element	Type	Gain
Antenna	23 element yagi	18 dB
Feedline	Belden 9913 coax, 100 ft.	-6 dB

With a signal of 10 dB S/N at the antenna feedpoint, it will be 4 dB S/N at the 1296 Mhz receiver (almost 1 'S' unit).

CONFIGURATION #3

Element	Type	Gain
Antenna	2 X 23 el yagi	21 dB*
Feedline	Belden 9913 coax, 100 ft.	-6 dB

With a signal of 13 dB S/N at the antenna feedpoint, it will be 7 dB S/N at the 1296 Mhz receiver (over 1 'S' unit).

CONFIGURATION #4

Element	Type	Gain
Antenna	2 X 23 element yagi	21 dB*
Feedline	7/8" hardline, 100 ft.	-3 dB

With a signal of 13 dB S/N at the antenna feedpoint, it will be 10 dB S/N at the 1296 Mhz receiver (almost 2 'S' units).

PREAMPLIFIER CONFIGFURATION #1

Element	Type	Gain
Antenna	2 X 23 element yagi	21 dB*
Feedline	7/8" hardline, 100 ft.	-3 dB
Preamplifier	18 dB at station, 2 dB NF	16 dB**

With a signal of 13 dB S/N at the antenna feedpoint, it will be 20 dB S/N at the 1296 Mhz receiver (about 3 1/2 'S' units).

PREAMPLIFIER CONFIGURATION #2

Element	Type	Gain
Antenna	2 X 23 element yagi	21 dB
Feedline	7/8" hardline, 100 ft.	-3 dB
Preamplifier	18 dB at antenna, 2 dB NF	16 dB**

With a signal of 13 dB S/N at the antenna feedpoint, it will be 33 dB S/N at the 1296 Mhz receiver (about 4 'S' units).

* - Note: This figure assumes nominal 3 dB gain for stacking 2 identical yagis with conventional spacing.

** - Adjusted for noise figure degradation (2 dB noise figure)

Table 1. Tabular form of the six antenna system configurations discussed.

⅞" line. Hardly cause for a mast-mounted preamplifier!

Some Microwave Non-Preamp Configurations

At 903 and 1296 MHz, there are many options to juggle. Antennas are physically smaller and stack easier to achieve additional gain. On the other hand, feedlines are lossier and noise figure becomes more critical. Let's look at some configurations.

The first configuration is a 1296 MHz station constructed around the SSB Electronics LT-23S transverter, which has a GaAs-FET front end with low-noise figure (under 2 dB). A small 23-element yagi with 18 dBi gain is selected. If conventional RG-8/U is selected for a 100-foot run, feedline losses approach 10 dB—substantial! System gain is thus 8 dB.

In the second configuration, 9913 cable replaces RG-8/U. The losses in that 100-foot run now are reduced to about 6 dB bringing the system gain up to 12 dB.

Let's replace the 23-element antenna with two stacked models in a third configuration. The system net gain is closer to 15 dB, and the previous losses are reduced in effect from 6 to almost 3 dB.

Using ⅞" hardline further reduces losses by 2.5 dB. This fourth system now approaches 17.5 dB—only .5 dB worse than the preamp configuration. There is an improvement of almost two S-units in the fourth configuration over the first—and no preamp is used. (At this point, an outboard preamplifier enhances signals at or below the threshold noise level. With an 18 dB preamp and 100 feet of 9913 on the receiver line, those signals improve as much as 2 S-units above the noise.)

I'm FB, You're FB

In my system, a Tonna 55-element yagi feeds about 65 feet of 9913. Let's calculate the overall gain.

This antenna indicated 21 dB of gain on the test range. The feedline incurs 3.9 dB of loss, leaving a net gain of 17.1 dB. The S/N degrades by about 4 dB (1 S-unit) at the LT-23S. With 60 to 70 watts output, system performance offers something close to reciprocity—the station I can hear can also hear me.

"Who wants to climb up a tower during a nice tropo session to make preamp repairs?"

Running a simple GaAsFET preamp at the shack of about 10 to 12 dB with a 1 dB noise figure makes it somewhat easier to hear those stations just above the noise level without much additional noise. On the other hand, installing a mast-mounted preamp probably requires a boost in output power levels to almost 200 watts (about a 4.5 dB increase) to realize any benefits. Otherwise, I'd be hearing and calling stations that might not respond. A more worthwhile improvement is to stack a pair of these yagis to pick up another 2.5–3 dB.

Final Words on Preamps

Use the best affordable receiver, erect the highest gain antenna that space and budget will allow, and select the lowest-loss affordable feedline. Only after these three parameters have been considered should one mast-mount preamplifiers for additional gain. Properly installed, antennas and feedline yield years of trouble-free service. No matter how careful a ham is with a mast-mounted preamp, it can still blow out from lightning and power line transients. Who wants to climb up a tower during a nice tropo session to make preamp repairs?

Curl up with a Good Book

The VHF/UHF Manual, edited by G.R. Jessop G6JP, is an excellent source of reference material for today's VHF/UHF operators. It's published by the RSGB (Radio Society of Great Britain) and available in the US through the ARRL and other book-by-mail services. The book is written in an easy-to-read style that contains a wealth of technical information, including an excellent section on wave propagation. A thorough discussion of tropospheric enhancement is presented. It also touches on weather terminology such as dew point, refractive index, and adiabatic processes.

There is a wealth of circuits. Although most of the components specified are of European nomenclature (such as RF transistors), tinkerers should be able to transpose to the more common numbers found in North America. Among the circuits are low-noise preamplifiers, converters, and a complete 144 MHz multimode receiver. There are also transverter, transmitter, and power amplifier circuits. There's also a large section on VHF and UHF antenna arrays.

Sections on microwaves, space communications and test equipment round out this book, which gives new meaning to "10 gallons in a five-gallon hat." The price is very reasonable, and it's an invaluable reference. Do yourself a favor and pick up a copy.

Coming Attractions

In the next two months, I will go into detail about my experiences with the LMW 2304 MHz transverter kit, which has just been completed. This unit consists of 6 separate boards—Universal Local Oscillator, Receive converter, Transmit converter, 144 MHz IF amplifier, Low Noise 2304 MHz preamplifier, and 2304 MHz Power Amplifier. Rather than do a typical product review, I will go through the assembly of each board so readers can benefit from the trial and tribulations encountered along the way.

The LMW kits are an inexpensive way to get active on 903, 1296 and 2304. The circuits are fairly simple and in most cases, easy to align and put on the air. There are little tricks, however, that a builder needs to be aware of in order to complete the project successfully. I hope that these columns will do just that. Perhaps readers may want to try their hand at assembling one of these kits in time for the summer... Until next month, see you Above and Beyond! 73

THE SMILEY ANTENNA CO.

THE HAND TUNED PERFORMANCE SYSTEM

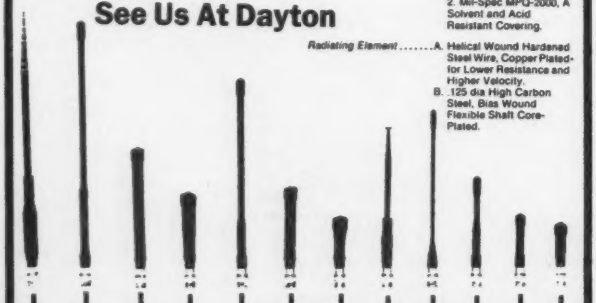
FEATURING PORTABLE RADIO SIMULATION TUNING

Electrical
Maximum Power .....50 Watts.
Frequency Range .....118-932 MHz.
Impedance.....Matched to the Portable Specialized Tuning Available.

Mechanical
Coating Material .....A. Dipped in Synthetic Rubber to Seal and Webb Coil, Preventing Distortion
B. 1. PVC Covering, 2. Mil-Spec MPQ-2000, A Solvent and Acid Resistant Covering.
Radiating Element.....A. Helical Wound Hardened Steel Wire, Copper Plated for Lower Resistance and Higher Velocity.
B. .125 dia High Carbon Steel, Bias Wound Flexible Shaft Core-Plated.

"Quality through Technology"

See Us At Dayton



FOR DEALER LOCATION CALL 619 579-8916

SMILEY ANTENNA CO., INC. 408 LA CRESTA HEIGHTS ROAD EL CAJON, CA 92021

CIRCLE 274 ON READER SERVICE CARD

Number 41 on your Feedback card

PACKET TALK

Latest in Digital Hamming

Brian Lloyd WB6RQN
19200 Tilford Way
Germantown MD 20874

Letters, Equalization, and Modems

WA6IGY Letter

Thomas Allen WA6IGY sent me an interesting letter. Tom worried that a properly equalized radio may be incompatible with a radio where the TNC is attached to the mike and speaker jacks. Tom also worried that removing the MF-10 and its bandpass characteristic would also degrade packet radio system performance.

Tom is right to be concerned. About equalization, it's very important that the demodulator duplicate as closely as possible the modulator output. This occurs only if the radios use the same equalization, and that is very unlikely (see last month's radio evaluation). By bypassing the trouble-causing stages in the radio, i.e. the clipper/limiter/lowpass filter in the transmitter, and the receiver audio stages, you know your starting point.

Modems clearly work, albeit poorly, with improperly equalized radios. If they didn't, most packet radio enthusiasts wouldn't be on the air at all. It would be nice if everybody took the time to ensure that their radios are properly equalized. It would be even nicer if the radio manufacturers considered packet to be a legitimate mode of operation, and design their radios accordingly.

MF-10 Filter

A bandpass filter ahead of the XR-2211 is desirable but that's not all that the MF-10 does. Designed also into the MF-10 is an EQ curve meant to boost the high tone by approximately 6 dB relative to the low tone. Since the XR-2211 is very sensitive to level differences in the tones, this high boost probably does more damage than out-of-band noise resulting from no bandpass filter. If you have the design capability to correct the EQ curve of the MF-10 filter, send your results to me so I can publish them here.

The simplest approach—the fewest components between the modulator and the demodulator—is the best. What you really want is your radio link to appear to be a piece of wire between modulator and demodulator with nothing added or removed from the signal. Every amplification or equalization stage reduces signal quality to some degree. A non-linear amplification stage or an improper EQ stage is a serious problem.

Modem Alternatives

Let's face it, using a Bell 202 modem with an NBFM radio is not very efficient. The 202's signal spectrum taxes the capacity of the radio's audio channel. We then use 12–15 kHz of RF bandwidth to transmit the signal—and all for a measly 1200 bits/second. There has to be a better way.

The first thing we can do is stop using NBFM radios and begin using linear (SSB) radios. Hams have been doing this for a long time in HF packet and RTTY. There's no reason why we can't do it on VHF and UHF as well. There are manifold advantages to transmitting the modulating signal directly (baseband) over sending it as an audio subcarrier over FM.

First, you save many kilohertz of bandwidth. Second, linear receivers produce a better S/N ratio under weak signal conditions than do FM receivers because of the FM threshold effect. This means that SSB allows us to fit more stations into a given amount of spectrum and we will not need as much power than with FM. It's not unreasonable to replace a 10 watt NBFM link with a 100 mW SSB link.

We could continue to use 1000 Hz shift FSK (Bell 202), but that poses problems with most of the available SSB transceivers. Most SSB transceivers have a 2.4 kHz wide filter designed to pass a communications-quality voice signal. While this may appear to fit perfectly (2,400 Hz wide signal in a 2,400 Hz wide filter) the fly in the ointment here is nonlinear group delay. This means that signals near the edge of the filter's bandpass propagate more slowly. This can distort the signal. Most modems can tolerate a small amount of this distortion but probably won't work with the amount that would occur in this situation. To make it work, we need to do one of the following: reduce the baud rate and the shift, widen the filter's passband, or come up with a more efficient modulation scheme. I've seen the cost of filters, especially those designed to minimize group delay and I'm not willing to double the cost of the radio. I also want to continue to send data at 1200 bauds or faster. This leaves me with one option: a different modulation scheme.

There are alternatives to FSK. Minimum Shift Keying (MSK) is a special case of FSK. MSK is characterized by a shift exactly half the baud rate (600 Hz for 1200 bauds). The biggest advantage of MSK is its greatly reduced bandwidth requirement. (The reason for this has to do with the phase relationship between the modulating signal and the carrier.) Where FSK has an efficiency of about 0.5 bps/Hz (it takes 2400 Hz of bandwidth to get 1200 bps), MSK has an efficiency that approaches 1 bps/Hz. Because of this, you need only slightly more than 1200 Hz of bandwidth to send 1200 bps. The reduced bandwidth requirements make the signal fit very nicely into a 2.4 kHz or even a 1.8 kHz wide filter. This is even an advantage when used with an NBFM transceiver. The narrow bandwidth of the modulating signal tends to minimize the equalization problem. This is a monumental improvement over the Bell 202 type modems.

There are MSK modems available for amateur packet radio. The 56 Kbps modem designed by Dale Hetherington WA4DSY generates an MSK signal and requires only 70 kHz to send data at 56 Kbps.

There are switch settings and minor component changes that will allow this modem to operate at speeds as low as 9600 bauds where the spectrum is no wider than a conventional NBFM voice signal. But what do we do on 10 meters and with our existing SSB radios? We use the MX-COM MX-519 modem, of course.

MX-519 Modem

MX-COM, Inc., of Winston-Salem NC, produces the MX-519, a one-chip 1200 baud synchronous MSK modem. This chip offers everything you need for a synchronous packet modem. It provides transmit and receive clocks, eliminating the need for a divider chain and a state machine. It also has a carrier detect circuit that does a first-class job of differentiating between QRN and a valid signal. This is something the 7910 World Chip modem, used in most commercially produced TNCs, doesn't do at all.

1200 Hz and 1800 Hz are the two modulating tones for the MX-519. The total bandpass required extends from about 800 Hz to 2200 Hz. This signal is very compatible with radios designed for voice operation (either FM or SSB). A TNC designed using this modem would be much simpler and probably cheaper than existing TNCs. Kantronics began to offer this modem as an option on their products. If you're interested in this modem I will have a construction article featuring it in a future issue of 73.

The demodulator in the MX-519 chip is a relatively ordinary FSK demodulator. This means you must give up about 3.9 dB in performance (the S/N ration must be 3.9 dB greater than the theoretical minimum for a given bit error rate). This, on the other hand, makes the MX-519 compatible with ordinary FSK modulators if they've been set to a shift of 600 Hz (1200 Hz and 1800 Hz tones).

The MX-519 is a real winner on 10m HF and with NBFM radios. All of the radios I evaluated last month should work well sending MSK data. The narrower bandwidth required by MSK pretty well does away with the EQ problems in the radios.

Icing on the Cake

It's possible to adjust existing TNCs that use the Exar 2206 modulator and 2211 demodulator (TNC-1 and TNC-2 compatible TNCs) to be more or less compatible with the MX-519. It won't be as good as an MX-519 talking to an MX-519, but it will work. (It's a shame that the 7910 World Chip modem isn't compatible with the MX-519). Simply adjust the 2206 modulator to generate a 1,200 Hz low tone and an 1,800 Hz high tone. The 2211 is adjusted to have a center frequency of 1,500 Hz instead of 1,700 Hz normally used for Bell 202 compatibility. That's all there is to it! I will report back next month after we gather some more performance data.

As nice as the MX-519 is, it's not perfect. In many cases it's not possible to give up the extra 3.9 dB of performance. There exists another modem for packet radio that has failed to receive the notoriety it deserves. I speak of the TAPR/AMSAT Binary Phase Shift Keying (BPSK) modem. The BPSK modem was designed to receive data from the satellite FO-12. Satellite communication

enthusiasts face the problem of limited power budgets available on most satellites, which do not permit high transmitter power. The difference must be made up in the receiving system, so every dB counts. The BPSK modem was designed to eke the last ounce of performance from a run-of-the-mill SSB radio. Its performance is within one dB of the theoretical maximum performance.

Anything that works this well in space can be used here on Earth. Several hams were working on the problems of moving packets around the state of Alaska. Parts of Alaska are somewhat inhospitable. Planting a digipeater on a mountain top is a serious exercise. These hams were experimenting with meteor scatter propagation as a possible solution to the problem (there is a continuous rain of small meteors that provide weak but reliable paths for many seconds out of every minute). They found the modems in the TNCs to be totally useless for this and the K9NG 9600 baud modems were not much better.

Tom Clark W3IWI visited Mike Rice KL7YV and just happened to have a pair of the then-experimental BPSK modems. Tom and Mike set up a test on 10m using a Yaesu FT-980 and a Kenwood TS-940. They performed the initial tests at full power over a 20-mile path that was not line-of-sight. As they determined that the channel was a good one, they began to reduce the power output from the transmitters. They found they could maintain reliable communications using only 2 to 3 mW of power. Tests of the lockup time showed that they needed a value of 10 to 20 ms for TXDELAY (the time between activation of PTT and the beginning of data transmission). Contrast that value with the 100 to 200 ms needed by most NBFM radios and Bell 202 modems.

The modem does have one rather clever bit of engineering. The demodulator generates a DC offset voltage when the carrier signal is either high or low. A comparator circuit recognizes this offset, and activates the frequency up/down control lines available at the mike jack of most of the current crop of SSB transceivers. This forms a digital AFC for the radio. This is primarily intended to permit hands-free correction of Doppler shift as a satellite moves across the sky, but works very well when used to provide correction for off-frequency stations while round-table operations are going on.

If you are interested in experimenting with the TAPR/AMSAT BPSK modem it's likely to be within your reach. TAPR sells a complete kit less enclosure for $100.

"The MX-519 is a real winner on 10m HF and with NBFM radios."

This includes everything you need for both terrestrial and satellite experimentation. This modem is designed to plug into TNC-1 or TNC-2 compatible device. Other types of TNCs should work as well if they have some sort of connector that allows external modem attachment.

Software Modem!

Tom Clark W3IWI and Bob McGwier N4HY have been working on a project involving the use of the new digital signal processor (DSP) chips. A DSP is a very fast processor that allows replacement of dedicated analog components with a DSP and some software. The DSP proposes to do for modems what the microprocessor did for dedicated control circuitry. Remember what rigs were like before microprocessors?

Tom and Bob have been working with an experimental board for PCs that permits construction (in software) of many different types of high-speed repetitive processes. So far Bob has constructed a number of interesting modems in software. Bob has implemented FSK, MSK, and PSK modems ranging from 1200 to 9600 bps including most of the commercial modems in the CCITT book. They are working on a newer, faster board to permit construction of 9600 bps and faster modems that can work with our existing crop of radios (they use adaptive equalization to automatically correct for the poor equalization built into our radios on a radio-by-radio basis).

If you think you might be interested in the software modem project, contact Bob McGwier N4HY for more details. His address is 15 Cherry Brook Road, East Windsor NJ 08520

Until next month! 73

from page 26

tenna. One may expect the full-size ¼-wave antenna, also tested here, to radiate more efficiently than the extended duckie, but the averaged results didn't show a difference.

On-the-air testing gave similar results, with no discernable differences between the two antennas. There were a few instances when the extended duckie and the ¼-wave antenna outperformed the stock antenna, when keying a repeater in a fringe area. Even in those cases, the longer antennas only made the signal less "scratchy."

½-wave

This beast is 41-¾ inches long when extended. It collapses to 8-⅛". The base section without the rest of the whip gave an SWR of over 3:1. On the air, the ½-wave antenna's performance was often amazing. A signal marginal on the stubby or stock antenna often was full-quieting on the ½-wave antenna. There were similar reports on the transmit side in a number of instances when attempting to use repeaters some distance away.

This antenna can make the difference between working someone and being lost in the noise. A ham won't want to carry this antenna around anywhere while fully extended, for fear of eventually damaging the radio's BNC connector or the antenna itself on some low-hanging object. This is less of a problem than with some of the ⅝-wavelength antennas on the market, but it is still a reasonable concern with an antenna approximately 3-½ feet long.

Summary

The "best" antenna here is defined by the ham's situation. For example, in a moderately large metropolitan area with numerous repeaters nearby, the stubby version will be a good choice—more than adequate performance in a smaller package.

"The 'best' antenna here is defined by the ham's situation."

Now for the helical ¼-wave and the full ¼-wave. These are for the ham who lives in a fringe area of a repeater of interest and just doesn't quite make it with the standard antenna. Both are noticeably larger than the stock antenna, but are not so large to create a hazard.

The more rural ham who doesn't want to be tied down by a fixed outdoor antenna should consider the ½-wave. They're great for operating at rest, but are often too clumsy for ambulatory operation. They are the most expensive of the lot, but they offer a significant improvement in signal strength over a standard rubber duckie.

A parting comment: with any of these antennas, if conditions are marginal, make sure to hold the antenna vertically. Antenna gain can drop up to 20 dB from the vertical to the horizontal position. It isn't uncommon to see a ham tilt his HT a considerable amount away from true vertical when holding the radio to his face. Even a 30-degree angle can make a change in signal strength that is greater than the differences seen when switching between the antennas described here. 73

	Stout Helical	Standard Rubber Duckie	Helical ¼-wave	Full-size ¼-wave	½-wave
Measured	−9 dB	−6 dB	−3 dB	−3 dB	−0 dB
Expected	−8 dB	−5 dB	−3 dB	−2 dB	−0 dB

Table 1. Measured and expected antenna gain figures for the listed HT antennas, relative to a ½-wavelength HT antenna.

HIGH PERFORMANCE PRESELECTOR-PREAMP

The solution to most interference, intermod, and desense problems in **AMATEUR** and **COMMERCIAL** systems.

- 40 to 1000 Mhz - tuned to your frequency
- 5 large helical resonators
- Low noise - High overload resistance
- 8 dB gain - ultimate rejection > 80 dB
- 10 to 15 volts DC operation
- Size - 1.6 x 2.6 x 4.75" exc. connectors
- **FANTASTIC REJECTION!**

Typical rejection:
±600 Khz@144 Mhz: –28dB
±1.6 Mhz@220 Mhz: –40dB
±5 Mhz@450 Mhz: –50dB

Price - CALL bipolar w/RCA jacks
Connector options: BCN $5, UHF $6, N $10
SUPER HOT! GaAs Fet option $20

AUTOMATIC IDENTIFIERS

ID-1

ID-2

- For transceivers and repeaters - **AMATEUR** and **COMMERCIAL**
- Automatic operation - adjustable speed and amplitude
- Small size - easy installation - 7 to 15 volts DC
- 8 selectable, reprogrammable messages - each up to 2 min. long
- Wired, tested, and programmed with your message(s)
  Model ID-1 - $49.95 Mode! ID-2 w/2 to 10 minute timer - $69.95

We offer a complete line of transmitter and receiver strips and synthesizers for amateur and commercial use.
Request our free catalog. *Allow $2 for UPS shipping - Mastercard and VISA welcome*

GLB ELECTRONICS,INC.
Dept H, 151 Commerce Pkwy., Buffalo, NY 14224
716-675-6740 9 to 4

CIRCLE 17 ON READER SERVICE CARD

PERFORMANCE AND VALUE WITHOUT COMPROMISE

KRP-5000 REPEATER

2 METERS-220-440

The first choice in
Transmitters - Receivers
Repeaters
Repeater Controllers
Power Amplifiers
Voice Mail Systems

CIRCLE 295 ON READER SERVICE CARD

NEWS BULLETIN

CALL US NOW!

YOUR HAM DOLLAR GOES FURTHER AT . . .

CALL OR WRITE FOR SPECIAL QUOTE

FAST DELIVERY HONEST DEALING and PROMPT DEPENDABLE S-E-R-V-I-C-E backup

Burghardt AMATEUR CENTER INC.

"AMERICA'S MOST RELIABLE AMATEUR RADIO DEALER"

SELL-TRADE

New & Reconditioned
HAM EQUIPMENT

Call or Write Us Today For a Quote!
You'll Find Us to be Courteous, Knowledgeable and Honest

PHONE (605) 886-7314
FAX (605) 886-3444

we'll treat you
SELECTION
S-E-R-V-I-C-E
and
SATISFACTION!

In 1937, Stan Burghardt (WØIT), because of his intense interest in amateur radio, began selling and servicing amateur radio equipment in conjunction with his radio parts business. We stand proud of this long-lasting tradition of ***Honest Dealing, Quality Products and Dependable "S-E-R-V-I-C-E"!***

Above all, we fully intend to carry on this proud tradition with even more new product lines plus the same ***"fair"*** treatment you've come to rely on. Our reconditioned equipment is of the finest quality with ***30, 60*** and even ***90-day*** parts and labor warranties on selected pieces. ***And always remember:***

STORE HOURS:
9-5 P.M. (CST)
MONDAY thru FRIDAY
OPEN SATURDAYS
from 9-1 P.M. (CST)
CLOSED
SUNDAYS/HOLIDAYS

— WE SERVICE WHAT WE SELL —

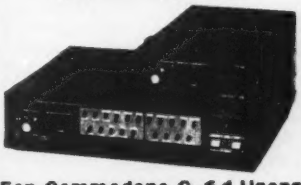
AEA	Belden	Icom	Nye
Alinco	Bencher	Jerold/Delhi	Palomar
Ameritron	Bird	Kantronics	Radio Callbook
Amphenol	Butternut	KDK/Encomm	Rohn
Amp Supply	Centurion	KLM	Telex/Hygain
Antenna Specialists	CES	Larsen	Ten-Tec
	Cushcraft	MFJ	Trio-Kenwood
Astron	Daiwa	Mirage	Unadilla/Reyco
B & W	Hustler	Moseley	Yaesu

Write today for our latest Bulletin/Used Equipment List.

182 N. Maple
P.O. Box 73
Watertown, SD 57201

CIRCLE 92 ON READER SERVICE CARD

PAKRATT™ Model PK-232
PAKRATT™ Model PK-64



For Commodore C-64 Users
Special Close-Out!!
PK-64 with HF Modem
with ASCII,Packet,Baudot,CW,Amtor
Now only $139.95

"CHOICE OF THE DX KINGS"

the CUBEX Skymaster FIBERGLASS QUAD KITS

2 ELEMENT— 3 BAND KIT SPECIAL

ONLY $249.95 FOB Calif.

CONTENTS

- 8 Fiberglass Arms, 1 pc. White 13 ft.
- 2 End Spiders (1 pc. castings)
- 1 Boom/Mast Coupler, 2" to 2"
- 16 Wraplock Spreader Arm Clamps
- 1 CUBEX QUAD Instruction Manual (Boom and wire not included)

MK III 2 EL COMPLETE "PRE-TUNED" QUAD ONLY $299.95

2-3-4 or more element Quads available. Send 50¢ (cash or stamps) for complete set of catalog sheets, specs & prices

CUBEX COMPANY
P.O. Box 732, Altadena, California 91001
Phone: (818) 798-8106 or 449-5925

YOU CAN'T SAY "QUAD" BETTER THAN "CUBEX"

CIRCLE 313 ON READER SERVICE CARD

KENWOOD TS940 OWNERS
Are you frustrated tuning in SSB & CW signals because of the too fast main tuning rate of 10 Khz/revolution???
Try the NEW Copyrighted Giehl Electronics Software Kit!!

Features:
- Main tuning rate of 2 Khz/revolution LSB, USB, CW & FSK
- Main tuning rate of 20 Khz/revolution AM & FM
- Tuning rate automatically increases when the knob speed exceeds 2 turns per second to make the long QSY's fast
- Split dot CW problems solved
- Easy to install (simply remove the old IC chip from its socket and plug in the new Giehl Electronics IC chip).
- Complete instructions

Send check or money order for $25 to:
Giehl Electronics
P.O. Box 18335, Cincinnati, Ohio 45218

N6KW QSL Cards
The finest QSL Cards at reasonable prices. Basic cards, map cards, cartoon cards, photo cards and more. Your idea converted to ink, or use standard designs. 525 ink colors, any type of card stock. Photos in b/w or beautiful color. Have a card that fits your style. Call or write for free samples and details. Postage appreciated.
Chuck Miller N6KW
KW Litho
P.O. Box 17390
Ft. Worth, TX 76102
(817) 332-3658

CIRCLE 235 ON READER SERVICE CARD

"There's No Better 10 Meter or CB Antenna Made"
Jo Gunn Enterprises
Route 1, Box 383
Ethelsville, AL 35461
(205) 658-2229
Hours: Mon - Fri, 10 am - 6 pm (CST)

JGAR – PISTOL

Specifications
Gain: 4.75 DB
Multiplication Factor: 12 Times
Power Rating: 2000 CW, 4000 PEP
Height: 10 Feet
Weight: 8.0 Lbs.
Materials: Anodized 6063T-6 Aircraft Aluminum Tubing
Requires 1 Coaxial Cable for Hook-up

JO GUNN Antennas

JGAR – HILLBILLY

Specifications
Gain: Horizontal - 5.25 DB, Vertical - 4.75 DB
Multiplication Factors: Horizontal - 17 Times, Vertical - 15 Times
Horz. to Vert. Separation: 20-25 DB
Power Rating: 2000 CW, 4000 PEP
Height: 11 Feet
Weight: 10 Lbs.
Materials: Anodized 6063T-6 Aircraft Aluminum Tubing
Requires 2 Separate Coaxial Cables for Hook-up

NEW 4 ELEMENT 10 METER BEAM NOW AVAILABLE

Call or Send $2.00 for Complete Catalog and Pricing of Antennas. ($2.00 Refundable on 1 st Order.)

DEALER INQUIRES, PLEASE CALL

INDUSTRIAL QUALITY REPLACEMENT BATTERIES FOR COMMUNICATIONS
Nickel-Cadmium, Alkaline, Lithium, etc.

Repair Packs For
ICOM®, KENWOOD, YAESU, SANTEC, AZDEN, TEMPO, CORDLESS PHONES....AND MORE!

NEW! I.C.E. PACK $49.95

MR. NICAD

E.H. YOST & CO.
EVERETT H. YOST KB9XI
7344 TETIVA RD.
SAUK CITY, WI 53583
ASK FOR OUR CATALOG
(608) 643-3194

CIRCLE 112 ON READER SERVICE CARD

SYNTHESIZED SIGNAL GENERATOR

MADE IN USA

MODEL SG-100F $429.95 delivered

- Covers 100 MHz to 199.999 MHz in 1 kHz steps with thumbwheel dial • Accuracy +/– 1 part per 10 million at all frequencies • Internal FM adjustable from 0 to 100 kHz at a 1 kHz rate • External FM input accepts tones or voice • Spurs and noise at least 60 dB below carrier • Output adjustable from 5-500 mV at 50 Ohms • Operates on 12 Vdc @ ½ Amp • Available for immediate delivery • $429.95 delivered • Add-on accessories available to extend freq range, add infinite resolution, AM, and a precision 120 dB attenuator • Call or write for details • Phone in your order as fast COD shipment.

VANGUARD LABS
196-23 Jamaica Ave., Hollis, NY 11423
Phone: (718) 468-2720 Mon.–Thurs.

CIRCLE 79 ON READER SERVICE CARD

THE PX SHACK Inc.
52 STONEWYCK DR.
BELLE MEAD, N.J.
(201) 874-6013 08502
HOURS: 10AM–3PM ORDERS
7PM–10PM TECH.

TONNA ANTENNAS

50–5el	$109	432–4x21H	$466
50–7el	$TBE	220–5el	$55
144–4el	$55	220–11el	$81
144–2x4	$67	220–19el	$129
144–2x9	$111	902–23el	$67
144–9port	$77	902–4x23H	$365
144–9fix	$75	1296–23el	$67
144–13el	$83	1296–4x23H	$365
144–17el	$129	1255–23ATV	$67
435–9el	$67	1296–55el	$99
435–19el	$77	1296–4x55H	$489
432–21DX	$92	2304–25el	$89
438–21ATV	$92	POWER DIVIDERS	
435–2x19	$85	144,220,432,902 1296,2304mHZ	

TRANSVERTERS

MICROWAVE MODULES

MMT50/144	20w 2m I.F.	$489
MMT50/28S	20w 28mhz I.F.	$489
MMT144/28	10w 28mhz I.F.	$259
MMT144/28R	25wGaAsFET/DBM	$489
MMT220/28S	15w 220–25	$279
MMT432/28S	10w W/OSCAR	$369

CIRCLE 29 ON READER SERVICE CARD

NextDay QSLs
Two-Color Rainbow Assortment
Call by 9 am
We delivery by 9am your time

Mapleton, Utah
KA7MQX
1971 N Oak Lane 1300 E
Provo, UT 84604-2138

Quantity	NextDay	2nd Day
100	$19.95	$14.95
200	$29.95	$24.95
400	$44.95	$39.95

AntennasWest
(801) 374-1084

CIRCLE 304 ON READER SERVICE CARD

HI-PERFORMANCE DIPOLES

MPO-5

ANTENNAS THAT WORK! CUSTOM ASSEMBLED TO YOUR CENTER FREQ.EA. BAND - ADVISE HT. OF CENTER AND EACH END - BAND AS INVERTED "V"- HORIZONTAL, VERT. DIPOLE, SLOPING DIPOLE - COMMERCIAL QUALITY - STAINLESS HARDWARE - LEGAL POWER - HI-TRAP, HIGH-EFFICIENCY DESIGN. PERSONAL CHECK, MO, OR C.O.D. (13)

MPO-5* 80-40-20-15-10M MAX-PERFORMANCE DIPOLE 87' LONG.....$185ppd
MPO-2 80-40M MAX-PERFORMANCE DIPOLE, 85'-LONG $82,...95'-$85ppd
MPO-3* 160-80-40M HI-PERFORMANCE DIPOLE 132' LONG.....$179ppd
SSD-5* 160-80-40-20-15-10M SPACE-SAVER DIPOLE 71' LONG.....$125ppd
SSD-5* 80-40-20-15-10M SPACE-SAVER DIPOLE-SPECIFY L. 42'-$105, 52'-$100ppd
SSD-4* 80-40-20-15M SPACE-SAVER DIPOLE-SPECIFY L. 46'-$ 93, 69'-$ 96ppd
*5-BANDS WITH HIGH-MATCHING-RANGE TUNER.

SASE FOR CATALOGUE OF 30 DIPOLES, SLOPERS, & SPACE-SAVING, UNIQUE ANTENNAS

W9INN ANTENNAS 312-394-3414
BOX 393 MT. PROSPECT, IL 60056

CIRCLE 38 ON READER SERVICE CARD

FOR THE BEST IN LINEAR AMPLIFIERS, ANTENNA TUNERS, TRANSCEIVERS, METERS ETC. REPLACEMENT PARTS, FACTORY SERVICE, NEW PRODUCT INFO. DOMESTIC, INTERNATIONAL DEALER INQUIRIES INVITED.

PO Box H
E. Rockaway, LI
NY 11518, USA
TLX 4758244
516/536-2629

the New DenTron Radio co. inc.

CIRCLE 263 ON READER SERVICE CARD

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

XT to the Rescue

Spring is finally on the horizon, and new things are blooming here at WA3AJR. The mail's been hot and heavy on the January Color Computer RTTY program. Many of the readers have been typing in the program from the magazine listing, and others have been downloading it from Delphi or requesting a copy from me. My offer stands—to obtain the program, send two dollars and a self addressed, stamped disk mailer and disk (or tape mailer and tape), and I will dump and mail off a copy.

Also new and exciting at the station is a "PC-XT compatible." I'm impressed with both how powerful the MS-DOS systems are and just how well the CoCo running under OS-9 performs! It often takes running a "big system" (if one can call the XT clone that) to appreciate what a well-designed little sibling can do. This gives me more reason than ever to look for RTTY programs for the PC.

Letters Department

Last month I mentioned that Ralph N. Della Rocca WA2STO, of Oakland, NJ, was looking to make WAS on RTTY. I received a nice note from him saying that, with RTTYers' help, he achieved this goal. Congrats, Ralph! Any more RTTYers out there want to try for this one?

At least a few readers asked where to find the "Galfo" program to run RTTY on an Apple II. This is an integer BASIC Apple program, and, the last I heard, was being offered by AEA in Lynnwood, WA, as their CP-1/Apple-1 disk, for about $30. Call them at (206) 775-7373.

Some readers are looking for specific information on the Teletype™ Model 35. I printed what I could about the Model 28 and Model 33, but I so far haven't found any info on the Model 35. I believe it's a Baudot version of a Model 33 (ASCII), so it should be useful on amateur RTTY.

Amiga users unite! By converting the ASCII to Baudot conversion outside of even a simple program, as in Figure 1, the UTU will run. Thanks, Harry!

I have a letter from Orlo Hudson W5LVA, of New Strawn, Kansas. Orlo's having trouble finding old-fashioned Teletype paper tape. My basement is one source! I have about 100 rolls to send out to anyone wanting them. This is the old yellow paper tape, five-level variety, as opposed to the eight-level tape the Model 33s use. It's the narrow stuff used on Model 19s and Model 14 equipment. For five bucks to cover handling and mailing, I'll send out boxes until they're gone. Those in the area can just stop by and take what they need.

I hope the readership will inform me of other sources of this tape, especially Mylar-based tape.

Guy Woods WA4KCN of Nashville, TN, is looking for a terminal program for the Kaypro computer that works with the AEA PK-232. He says that, while he has a C-64 and PK-64, RFI is a real problem.

I sympathize with Guy. With my CoCo setup, which includes an external bus and all kinds of cable going in and out, RFI is worse than on a stock CoCo. The buzzing is often bad enough to obscure the signal to copy. (Using the PC clone, I'm impressed by the lack of chirping birdies as I tune across the dial.)

Any terminal program currently used to access a modem will work just fine with the PK-232. I'm using a "shareware" program called QMODEM, which supports all kinds of bells and whistles. It is available for MS-DOS machines on many local BBSs. Similar programs, I am sure, are available for the Kaypro. Good luck, and again, let us hear from you.

The next letter comes from Rodolfo Frederico Dibo PY1ACG of Rio De Janeiro, Brazil. He writes that his computer is a Brazilian computer—an XP800 Expert MSX—and he wants to put it on RTTY.

It's likely the MSX is compatible with something here in the States, but what? I look for the readers' input on this one, and will pass along what turns up.

Another success story to report. A while back, I related the tale of Paul Johnston KA5FYI of Austin, TX—the "Texas Turkey" who wanted to get into RTTY. He related going with the C-128, and running a Kantronics KAM with the computer in C-64 mode. Having used all modes except AMTOR, he offers a few comments.

> ***"Any terminal program currently used to access a modem . . . will work just fine with the PK-232."***

"Even though there are several programs on the Pacterm disk, only the 'Pacterm' program works with the KAM when hooked up with the five wires on the card connector as explained in the program's instructions.

"Despite the name 'Pacterm,' it works on CW, RTTY, ASCII, AMTOR and packet with the KAM. The other programs on the disk work with Kantronics' other terminals.

"There is no 'type ahead' feature with Pacterm. However, it does have the feature of file transmission. This is handy.

The operator can record various typed responses found in a prerecorded 'first QSO.' Just call the file up and have it transmitted and save yourself some typing. Pacterm also provides for storage of a conversation on disk.

"The instructions to the KAM are poorly organized and written for a beginner to computers and computer communication interfaces. I understand that technical manuals are sometimes poorly written and organized. I'll have to accept that, but don't like it.

"The KAM has two ports, VHF and HF. VHF is bound to packet unless the operator removes the wires going to the HF rig from the HF port and connects them to the VHF rig. Then two-meter CW and ASCII are available. Of course, the wires to the VHF rig from the VHF port are not connected at this time. A switching console would be handy here."

The above is a summary of Paul's letter. It sounds like he worked through all his early problems. No doubt the folks at Kantronics, who read this column, will send me the rest of the story!

Other Digital Communication News

This column is on more than just RTTY. It tries to cover all facets of digital communications and computers.

Here's a challenge from Bud Barber, in Aurora, CO. Bud would like to use his computer to read the digital time information transmitted by WWV and affiliates. I recall an article in QST years ago about how that information was encoded, but can't locate it now. I believe that it was ASCII at some high rate. Of course, it could have changed since then, but anything is workable with enough information.

Anyone know about this one? Drop me a line, and I'll put it through to the masses!

A Decade of RTTY Columns

Still available from the dusty stacks here is a list of past RTTY Loop columns for reprints of the last eleven years or so. I'll send the index along for a self-addressed, stamped business-sized envelope with two ounces of postage on it. Reprints are two dollars and a SASE. All three published CoCo RTTY programs are also available, with the latest and greatest as detailed in January, 1988, and mentioned above. And, of course, I make every effort to respond to all questions. For a mailed response, be sure to include the SASE. Electronic folks reaching me via CompuServe (75036,2501) or Delphi (MARCWA3AJR) get off luckier, but it's hard to send diagrams on E-mail!

Until next month! 73

SIMPLE AMIGA TERMINAL PROGRAM

```
OPEN "COM1:300,N,8,1" AS 1
WHILE 1
  WHILE LOC(1)>0
  PRINT INPUT$(1,1);
  WIDTH 77

WEND
  I$=INKEY$
  IF I$>" THEN PRINT #1,i$;

WEND
```

DAYTON Hamvention®

April 29, 30, May 1, 1988

Early Reservation Information

- **Giant 3 day flea market • Exhibits**
- **License exams • Free bus service**
- **CW proficiency test • Door prizes**

Flea market tickets and grand banquet tickets are limited. Place your reservations early, please.

Flea Market Tickets
A maximum of 3 spaces per person (non-transferable). Tickets (valid all 3 days) will be sold IN ADVANCE ONLY. No spaces sold at gate. Vendors MUST order registration ticket when ordering flea market spaces.

Special Awards
Nominations are requested for "Radio Amateur of the Year", "Special Achievement" and "Technical Achievement" awards. Contact: Hamvention Awards Chairman, Box 964, Dayton, OH 45401.

License Exams
Novice thru Extra exams scheduled Saturday and Sunday by appointment only. Send FCC form 610 (Aug. 1985 or later) - with requested elements indicated at top of form, copy of present license and check for $4.35 (payable to ARRL/VEC) to: Exam Registration, 8830 Windbluff Point, Dayton, OH 45458

Hamvention Video
VHS video presentation about the HAMVENTION is available for loan. Contact Dick Miller, 2853 La Cresta, Beavercreek, OH 45324

1988 Deadlines
Award Nominations: March 15
Lodging: April 2
License Exams: March 26
Advance Registration and banquet:
USA - April 4 Canada - March 31
Flea Market Space:
Orders will not be processed **before** January 1

Information
General Information: (513) 433-7720
or, Box 2205, Dayton, OH 45401
Flea Market Information: (513) 898-8871
Lodging Information: (513) 223-2612
(No Reservations By Phone)

Lodging
Reservations received after Housing Bureau room blocks are filled will be returned along with a list of hotel/motels located in the surrounding areas of Dayton. The reservation will then become the responsibility of the individual.

HAMVENTION is sponsored by the Dayton Amateur Radio Association Inc.

Lodging Reservation Form

Dayton Hamvention - April 29, 30, May 1, 1988
Reservation Deadline - April 2, 1988

Name _____

Address _____

City _____ State _____ Zip _____

Phone _____

Arrival Date _____
[ ] Before 6 pm [ ] After 6 pm
Departure Date _____

Rooms: [ ] Single [ ] Double (1 bed, 2 persons)
[ ] Double Double (2 beds, 2 persons)

Deposit required - Room deposit must be paid directly to the hotel or motel by date shown on the confirmation form sent to you. Use canceled check for confirmation.

Mail to - Lodging,Dayton Hamvention, 1880 Kettering Tower, Dayton, OH 45423-1880

(PLEASE SEPARATE)

Advance Registration Form

Dayton Hamvention 1988
Reservation Deadline - USA-April 4, Canada-March 31

Name _____

Address _____

City _____ State _____ Zip _____

	How Many		
Admission (valid all 3 days)	_____	@ $8.00*	$_____
Grand Banquet	_____	@ $16.00**	$_____
Women's Luncheon (Saturday)	_____	@ $6.75	$_____
(Sunday)	_____	@ $6.75	$_____
Flea Market (Max. 3 spaces)	_____	$23/1 space $50/2 adjacent	
Admission ticket must be ordered with flea market tickets		$150/3 adjacent	$_____
		Total	$_____

* $10.00 at door ** $18.00 at door, if available

Make checks payable and mail S.A.S.E. to -
Dayton Hamvention, Box 2205, Dayton, OH 45401

the HAM STATION

P.O. Box 4405
220 N. Fulton Ave.
Evansville, IN 47710

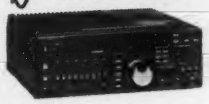
Store Hours
MON-FRI: 9AM - 6PM
SAT: 9AM - 3PM
CENTRAL TIME

SEND A SELF ADDRESSED STAMPED ENVELOPE (SASE) FOR NEW AND USED EQUIPMENT SHEETS

WARRANTY SERVICE CENTER FOR: ICOM, YAESU, TEN-TEC

FOR SERVICE INFORMATION CALL (812) 422-0252
MONDAY - FRIDAY
9:00 AM - 12:00 NOON

YAESU



FT-767
- HF/VHF/UHF Base Station
- Plug-in Modules for 6m, 2m, 440 MHz
- Loaded with Features

FT-727R
- Two Affordable Radios in One
- 2m/440 MHz Handheld
- 5W on Both Bands
- Ten Memories
- Multi-Scan Systems
- Battery Saver

ICOM

IC-761
- Top-Of-The-Line High Performance HF Transceiver
- Built-In Power Supply
- Built-In Automatic Antenna Tuner
- SSB, CW, FM, AM, RTTY
- 160-10m General Coverage Receiver

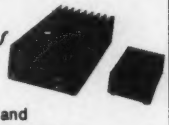
ALINCO

ALD-241
- Dual Band Mobile 140-149.995 MHz/ 440-450 MHz
- 21 Programmable Memories
- 25 Watts Output on Both Bands
- Loaded with Extra Features

TEN-TEC

PARAGON
- Full Featured Synthesized HF Transceiver
- General Coverage Receiver
- 100w Output
- SSB, CW, FSK, Optional FM
- 62 Programmable Memories
- Made In USA

rfconcepts



VHF/UHF AMPS
- High VSWR and Overdrive Protection
- 5 Year Warranty, 6 Months on RF Transistors
- All Units have GaAsFET Receive Pre-amps

TERMS:
Prices Do Not Include Shipping.
Price and Availability Subject to Change Without Notice
Most Orders Shipped The Same Day
COD's Welcome

AEA, ARRL, ALINCO, ALLIA
ANTENNA SPECIALISTS, AS
CUSHCRAFT, DAIWA, DIAM
KANTRONICS, KENPRO, LA
RF CONCEPTS, ROHN, SAN
TOKYO HY-POWER, VIBROF

Hy-Gain & Cushcraft Spring Antenna Specials
Verticals,
Monobanders,
Tribanders,
VHF, OSCAR, Yagis
Call For Savings Today!

, AMERITRON, AMP SUPPLY,
UT, B&W, CSI, CALLBOOK,
USTLER, ICOM, KDK,
AGE/KLM, NYE, PALOMAR,
ELEX/HYGAIN, TEN-TEC,
YAESU

For Orders and Price Checks Call 800-523-7731

Indiana and Information
Call 1-812-422-0231

Setting a new standard of efficiency in moderately priced kilowatt amplifiers

AMERITRON®

AL-80A LINEAR AMPLIFIER

The Ameritron AL-80A combines the time proven economical 3-500Z with a heavy duty tank circuit to achieve nearly 70% efficiency from 160 to 15 meters. It has wide frequency coverage for MARS and other authorized services. Typical drive is 85 watts to give over 1000 watts PEP SSB and 850 watts CW RF output. A Pi-L output circuit for 80 and 160 gives full band coverage and exceptionally smooth tuning.

The AL-80A will provide a signal output that is with ½ "S" unit of the signal output of the most expensive amplifier on the market—and at much lower cost. Size: 15½" D. x 14" W. x 8" H. Weight: 52 lbs.

PLUS OTHER QUALITY AMERITRON PRODUCTS:
AL-1200 and AL-1500 Amplifiers—1500W CW output
AL-84 Amplifier—400W CW output
RCS-4 HF Remote Wireless Switch
RCS-8V DC-UHF Remote Switch
PIN-5 QSK Switch

ATR-15 TUNER

The Ameritron ATR-15 is a 1500 watt "T" network tuner that covers 1.8 through 30 MHz in 10 dedicated bands. Handles full legal power on all amateur bands above 1.8 MHz.

Five outputs are selected from a heavy duty antenna switch. The ATR-15 has a peak reading watt meter, SWR bridge and a dual ratio balun. Size: 6" H. x 13¼" W. x 16" D.

Available at your dealer—Send for a catalog of the complete AMERITRON line.

AMERITRON, Division of Prime Instruments, Inc.
9805 Walford Avenue • Cleveland, Ohio 44102 • (216) 651-1740

CIRCLE 314 ON READER SERVICE CARD

ASSOCIATED RADIO

8012 CONSER BOX 4327
OVERLAND PARK, KANSAS 66204

VISA—MC
AMEX—DISC.

(EVERY DAY A HAMFEST)

BUY—SELL—TRADE

ALL BRANDS NEW AND RECONDITIONED

WE'LL BUY YOUR EXTRA RIG
STATIONS—ESTATES ETC.
Call 913/381-5900
FAX 913/648-3020
SEND $2 FOR CATALOG AND WHOLESALE LIST

SUPER PERFORMANCE BATTERIES

SUPER ICOM BP-7S, 13.2 volts, 900 ma, double the capacity of the Icom BP-7, 5w output.
SUPER ICOM BP-8S, 9.6 volts, 1200 ma, 50% more capacity than the Icom BP-8.
Both are base charge only, BP-7S or BP-8S $65.00*
Exact replacement FNB-2 Nicad pack for YAESU FT-404R/207R/208R with case. $24.00*

Inserts for:

Kenwood PB-25	$25.00*	Icom BP-3	$20.00*
Kenwood PB-25H, PB-26	$27.00*	Icom BP-5 (500ma)	$26.00*

*Add $3 shipping & handling. CT residents add 7½% tax.

Complete line of NICAD packs for Icom, Kenwood, Tempo, Santec, Azden, Cordless Telephones, Alkaline, Nicad, Mercury and Lithium Cells. All battery packs include a 1 year guarantee. Commercial Radio Packs also available.
"Write or call today for a complete catalog."
Dealer inquiries invited.

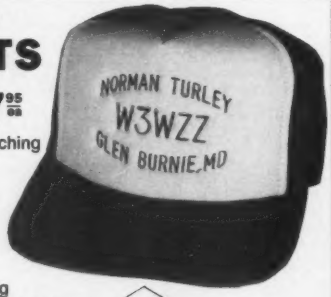
PCRAPHCX Inc.
149 Palmer Road • Southbury, CT 06488

VISA (800) 634-8132 In CT (203) 264-3985 MasterCard

CIRCLE 68 ON READER SERVICE CARD

CUSTOM EMBROIDERED
QUALITY HAM HATS

Display your **name, call and hometown** on our **top quality** summer mesh cap with white seamless front and matching bill $7.95 ea
They come in **royal blue, red & brown** with matching color thread
WINTER CORDUROY also available in red & navy blue with white thread $8.95 ea
Please send: first & last name (max. 14 ltrs) call (max. 6 ltrs), city & state (max. 14 ltrs)



BE SURE TO INCLUDE COLOR
Send Check or Money Order, Plus $3.00 Shipping and Handling Per Order. Add 25c for each add'l cap ordered.
ALLOW 3 TO 5 WEEKS FOR DELIVERY. MD RESIDENTS ADD 5% SALES TAX
WE WELCOME INQUIRIES FROM CLUBS

Embroidery Warehouse
P.O. Box 1476 • Severna Park, MD 21146

K2RAG Antenna Products
PERFORMANCE +©

New! Improved! K2RAG Balun $29.95

Models:
RAG-1.1A (50/75 balanced-50/75 unbalanced)
RAG-4.1A (300/200 balanced-75/50 unbalanced)

- Broadband 0.5 to 50 MHz. one balun covers all bands
- Exclusive ANTENNA FEEDLINE PROTECTOR © eliminates damaged coax connections
- 2000 watt PEP rating

Handbook of Ham Radio Antennas also available for $4.95 or FREE if you order product now.

10 day money back guarantee. Dealer inquiries invited. Please send check or money order. Add $3.00 for postage and handling. Visa, MC also accepted.

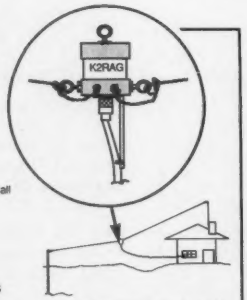
New! K2RAG All Band Linear Resonating Sloper

Model: RAG-LRS

- 60 ft. long, factory assembled, easy to install
- No traps, full power
- Continuous coverage 3-30 MHz. automatic band switching
- Commercial quality

K2RAG Balun Matched Dipoles

Model	Band	Length	Price
RAG-D160	160	260'	$79.95
RAG-D80	80	133'	$59.95
RAG-D40	40	67'	$49.95
RAG-D20	20	33'	$43.95
RAG-D15	15	22'	$43.95
RAG-D10	10	16'	$43.95



"30 years experience"
Antenna Systems Inc.
14465 SW Hazelhill DR.
Tigard, OR 97224 U.S.A.
503-684-5350

CIRCLE 122 ON READER SERVICE CARD

Need Quick Turnaround on CRYSTALS?

Try Our E.O.D.
(Emergency Order Dept.)

and get

JAN QUALITY and STABILITY PLUS Low Prices!

You benefit from 21 years of manufacturing quality crystals for industry, military services, radio amateurs, citizen band and experimenters.

To Get Free Catalog Call or Write

JAN CRYSTALS
P.O. Box 06017
Ft. Myers, FL 33906
(813) 936-2397

VISA MasterCard

CALL 1-800-237-3063
FREE (Except Florida)

CIRCLE 22 ON READER SERVICE CARD

Number 31 on your Feedback card

Hams Around the World

Chod Harris VP2ML
PO Box 4881
Santa Rosa CA 95402

DX Gatherings

What do DXers do when they're neither tuning the bands nor putting up new antennas? They're probably getting together to boast about the rare DX they worked, the pileups they busted and occasionally the ones that got away. They do this on the air, at local club meetings, and at major DX gatherings around the country.

Visalia

The largest of the pure-DX gatherings in the country, and possibly the world, happens every year at the International DX Convention in Visalia, California. The Northern and Southern California DX Clubs originally selected the Visalia site to hold joint meetings there, because the location is about the same distance from Los Angeles and San Francisco.

Visalia convenes in April, usually the weekend before the Dayton Hamvention. The Northern and Southern California DX Clubs sponsor it in alternate years. The 1988 dates are are April 22–24, and the sponsor is the Southern Cal DX Club.

Visalia offers 48 hours of solid DX and DXers beginning Friday afternoon, as hundreds of DXers carpool to remote Visalia from the population centers of the state. Out-of-staters and foreign guests and visitors often hitch rides with the locals. Once a year, the central California 2-meter repeaters bristle with dozens of world famous DX callsigns.

A cocktail party and dinner caravans to downtown Visalia cap Friday evening. By hanging around the pool on Friday, a DXer will spot many of the best known DX callsigns from all corners of the globe: OH2BH, ZL1AMO, SM0AGD, LA1EE, D44BC, W6KG and W6YL, K5VT, W3AZD, and dozens more.

The formal program starts early Saturday morning. Thisincludes contest and DX forums, DXpedition presentations, CW copying contests, antenna seminars, and technical programs. It's capped by a banquet with the guest of honor that night. The 1987 banquet featured the first-ever report of the Peter I Island trip. Informal hospitality suites run into the early morning hours, before bleary-eyed DXers arise for the Sunday morning brunch and another major DXpedition presentation. Around noon the gang breaks up for the long drive home.

The Grosvenor Holiday Inn in Visalia, site of the convention, books up very early. The Holiday Inn 800 telephone number simply reports that the hotel is booked, but DXers can reserve rooms as late as January by calling the hotel direct at 800/821-1127 9–3pm Pacific time. Registration for the 1988 convention is $44, including the banquet and brunch, via Don Bostrom N6IC, 4447 Atol Ave., Sherman Oaks, CA 91423, or at the door.

Dayton

Although not a pure DX convention, the Dayton Hamvention attracts more DXers to a single spot than any other event. DXers try to stay at the Stouffers 513/224-0800, but you practically have to reserve next year's room as you check out this year to be assured of a bed.

In addition to all the fancy DX equipment, the huge flea market, and all the other booths at the Hara Arena, DXers can now enjoy a Friday night dinner at the Stouffers, sponsored by the Southwest Ohio DX Association. Previous dinner speakers include Lee Wical KH6BZF and Bob Locher W9KNI. Saturday everyone goes to the arena for the contest forum and the DX forum, which last most of the day. The DX forum includes DXpedition reports, technical talks, and DXCC and DXAC news. The 1987 forum featured, among others, LA2GV on Peter I island, the Colvins, the XF4DX trip, and W3AZD on DXCC.

On Saturday night, many major DX clubs sponsor hospitality suites at the Stouffers, which feature videotapes, slide shows, CW-copying contests, and comraderie. Sign-up sheets at the doors to these suites read like the Who's Who of DX, including dozens of DXers from every corner of the globe. Among the best suites are those of the Southeastern DX Club and the Kansas City DX Club. The Mad River Contest Club, Yankee Clipper Contest Club, Canadian DX Association, and the Long Island DX Association have also hosted suites in past years.

The 1988 Dayton Hamvention is April 28–May 1. Registration is $8 to Box 2205, Dayton OH 45401. The DX Dinner will be Friday, April 29 at the Stouffers. Cost is $20 and reservations must be made in advance to Jay Slough K4ZLE, 8183 Woodward Drive, West Chester OH 45069.

Jim O'Connell presents the DX Hog of the Year Award to W9DWQ.

"The (British Columbia) DX gang provides some of the best hospitality anywhere, in one of the world's most attractive cities."

Northwestern DX Convention

After the two consecutive weekends of Visalia and Dayton, the DX convention-goer needs time to recuperate. Fortunately, the next DX convention is not until the fourth weekend in July. The Northwestern DX convention rotates between Portland, Oregon, (Willamette Valley DX Club), Seattle, Washington, (Western Washington DX Club) and Vancouver, British Columbia (British Columbia DX Club). The 1988 convention will be in Vancouver, where the BC DX gang provides some of the best hospitality anywhere, in one of the world's most attractive cities.

DXPO

DXPO alternates between Washington DX (North Capitol DX Association) and Atlanta, GA, (Southeastern DX Club.) Typically held in early Fall, DXPO features a full day of speakers and seminars on Saturday, followed by a banquet presentation. Sunday morning brunch wraps up the weekend of activities. DXPO 88 will be held in the Washington, DC, area.

W9DXCC Meeting

Another Fall DX gathering is the W9DXCC meeting, sponsored by the Northern Illinois DX Association, held in theChicago area in Mid-September (Sept. 17th in 1988.) This well-run affair starts with hospitality suites Friday night, and features a jam-packed program all day Saturday. 1987 program topics included packet radio in DX, 75 meter yagis, Peter I Island, PRB-1 update, ARRL Forum, VP2ML, and Ms. Bharathi VU2RBI on the VU4APR Andamans DXpedition. In addition to the banquet speaker (K9AJ on XF4DX in 1987), the evening includes the presentation of the DX Hog of the Year Award, a somewhat dubious honor whose symbol is a gold-painted pig on a trashcan lid.

The opportunity to share DX experiences and learn from more accomplished DXers is another unique element of these events. Why not attend one in 1988?

FUN!

Ham Radio's Lighter Side

John Edwards KI2U
PO Box 956
Mt. Laurel NJ 08054

FUN POLL: How Hams View Themselves

The results are in! From Lawrence Welk Village to Sun City to RV parks nationwide, hams have made their views known.

Yes, the results to the December '87 poll are here. As usual, loyal FUN! fans responded by the thousands to the approximately annual FUN! Poll.

Read 'em and enjoy.

ELEMENT 1—BACKGROUND

1) Sex:
A) Male–97%
B) Female–3%

2) Age:
A) 15 or below–1%
B) 16–21–3%
C) 22–39–31%
D) 40–59–42%
E) 60 or above–22%

3) License class:
A) Novice–3%
B) Technician–19%
C) General–17%
D) Advanced–33%
E) Extra–28%

4) Number of years licensed:
A) 1 year or less–9%
B) 1–5 years–14%
C) 6–10 years–13%
D) 11–20 years–17%
E) 21 years and up–47%

5) Do you have a new (post-March) '78 call?
A) Yes–51%
B) No–49%

6) How many hours a week do you devote to amateur radio?
A) 0–1 hours–12%
B) 2–5 hours–36%
C) 6–10 hours–28%
D) 11–20 hours–17%
E) 21 hours or more–7%

7) Which HF band do you use most?
A) 80–75 meters–18%
B) 40 meters–21%
C) 20 meters–21%
D) 15 and/or 10 meters–25%
E) Don't operate HF–15%

8) Which VHF/UHF band do you use most?
A) 6 meters–3%
B) 2 meters–82%
C) 220 MHz–2%
D) Higher frequencies–3%
E) Don't operate VHF/UHF–10%

9) Which mode do you use most?
A) SSB–32%
B) CW–28%
C) FM–30%
D) RTTY–6%
E) Other–4%

10) How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazine subscriptions, club dues and other incidental expenses.)
A) $0–$250–30%
B) $251–$500–20%
C) $501–$1,000–22%
D) $1,001–$2,500–18%
E) $2,501 and up–10%

ELEMENT 2—SOCIAL CHARACTERISTICS

11) On the whole, hams are:
A) Too young–2%
B) Too old–60%
C) Just the right age–38%

12) Do you like rock music?
A) Yes–44%
B) No–56%

13) Politically, how would you define yourself?
A) Conservative–58%
B) Middle-of-the-road–32%
C) Liberal–10%

14) Should we get rid of the ARRL?
A) Yes–4%
B) No–96%

15) How old were you when you first became a ham?
A) 15 or below–35%
B) 16–21–20%
C) 22–39–20%
D) 40–59–20%
E) 60 or above–5%

16) Should the FCC increase the speeds on amateur CW examination?
A) Yes–5%
B) No–95%

17) Do you own a home computer?
A) Yes–80%
B) No–20%

18) If you answered "yes" to question 17, which brand?
A) Apple–20%
B) IBM–20%
C) Radio Shack–5%
D) Commodore–45%
E) Other–10%

19) Do you think that home computing is siphoning people (including youngsters) away from amateur radio?
A) Yes–50%
B) No–50%

20) Are hams getting dumber?
A) Yes–40%
B) No–60%

21) Do business interests deserve some of our virtually abandoned bands?
A) Yes–25%
B) No–75%

22) Should ham licenses have a minimum age requirement?
A) Yes–5%
B) No–95%

23) Should ham licenses have a maximum age requirement?
A) Yes–4%
B) No–96%

24) Should hams be subject to periodic retesting?
A) Yes–28%
B) No–72%

ELEMENT 3—OPERATING HABITS

25) If the users were restricted to data communication only (no phone or CW operation), would you be in favor of a no-code 220 MHz Digital-class license?
A) Yes–64%
B) No–36%

26) Would you be in favor of such a no-code 220 MHz Digital-class ticket if it permitted phone operation in addition to data transmission?
A) Yes–44%
B) No–56%

27) Have you ever used a personal computer in connection with your amateur radio activities?
A) Yes–80%
B) No–20%

28) Is it time to completely deregulate amateur radio by having the FCC turn over all responsibility for ham operation to the amateur community?
A) Yes–12%
B) No–88%

29) What do you think of CW keyboards?
A) Love them–44%
B) Hate them–56%

30) Should we get rid of, or reduce in size, the CW bands?
A) Yes–20%
B) No–80%

31) Do you think DX nets have a place in ham radio?
A) Yes–92%
B) No–8%

32) Do you think nets in general have a place in ham radio?
A) Yes–96%
B) No–4%

33) The next time a ham operates from space, which band should he/she use?
A) 2 meters–60%
B) 220 MHz–16%
C) 450 MHz–16%
D) An even higher band–8%
E) Shouldn't bother to operate–0%

34) If, while tuning across a band, you heard a net called "Jammers International" in progress, would you:
A) Jam it–0%
B) Ignore it–56%
C) Complain to the FCC orsome other organization–12%
D) Listen–32%
E) Join it–0%

35) If required, could you solidly copy CW at the speed at which you were licensed?
A) Yes–60%
B) No–40%

36) If required, could you pass the FCC theory test for your license class?
A) Yes–90%
B) No–10%

37) Have you ever purposely operated in an amateur subband you weren't licensed to use?
A) Yes–10%
B) No–90%

38) Are you fluent in any computer language?
A) Yes–80%
B) No–20%

39) If you answered "yes" to question 38, which language?
A) BASIC–43%
B) Pascal–9%
C) Assembler–14%
D) Machine–14%
E) Other–20%

40) Do you feel yourself competent to write a short BASIC program?
A) Yes–60%
B) No–40%

41) Do you feel yourself competent to replace the finals in a transistor-type rig?
A) Yes–92
B) No–8

42) Do you solder together your own coax connectors?
A) Yes–96%
B) No–4%

43) Do you smoke while operating?
A) Yes–20%
B) No–80%

44) Do you operate a packet radio system?
A) Yes–30%
B) No–70%

45) What do you think of contesting?
A) Great–16%
B) Good–28%
C) Okay–36%
D) Don't like it–16%
E) Despise it–4%

46) What do you think of DXing?
A) Great–24%
B) Good–40%
C) Okay–32%
D) Don't like it–4%
E) Despise it–0%

47) What do you think of repeaters?
A) Great–60%
B) Good–28%
C) Okay–8%
D) Don't like them–0%
E) Despise them–4%

48) What do you think of traffic handling?
A) Great–44%
B) Good–12%
C) Okay–32%
D) Don't like it–8%
E) Despise it–4%

49) If you heard an emergency net in progress, would you immediately join in and offer your services?
A) Yes–58%
B) No–42%

50) Have you ever secretly hoped for a minor disaster to strike your community so you can demonstrate your radio skills?
A) Yes–12%
B) No–88%

DEALER DIRECTORY

CALIFORNIA

Burbank

New HAM store open and ready to make a DEAL. We carry all lines, ship UPS, and are open Sunday. **A-TECH ELECTRONICS, 1033 Hollywood Way, Burbank CA 91505; (818)845-9203.**

San Diego

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes…Electronically speaking, Gateway's got it! M-F 9-5:30 Sat. 9-5. **GATEWAY ELECTRONICS, 4633 Convoy St., San Diego CA 92111; (619)279-6802.**

COLORADO

Denver

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes…Electronically speaking, Gateway's got it! M-F 9-5:30 Sat. 9-5. **GATEWAY ELECTRONICS, 5115 N. Federal Blvd. #32, Denver CO 80221; (303)458-5444.**

DELAWARE

New Castle

Factory authorized dealer! Yaesu, ICOM, Ten-Tec, KDK, Kenwood, AEA, Kantronics, Santec. Full line of accessories. No sales tax in Delaware. One mile off I-95. **DELAWARE AMATEUR SUPPLY, 71 Meadow Road, New Castle DE 19720; (302)328-7728.**

Wilmington

Delaware's friendliest ham store. Also Shortwave supplies. **AMATEUR & ADVANCED COMMUNICATIONS, 3208 Concord Pike, Wilmington DE 19803; (302)478-2757.**

FLORIDA

Miami

Casa Marconi, Inc. Pre-owned communications equipment. We do repairs.**CASA MARCONI, INC., 7189 SW 8th Street, Miami FL 33144; (305)264-8443; (305)264-8443.**

HAWAII

Honolulu

Kenwood, ICOM, Yaesu, Hy-Gain, Cushcraft, AEA, KLM, Tri-EX Towers, Fluke, Belden, Astron, Etc. **HONOLULU ELECTRONICS, 819 Keeaumolu Street, Honolulu HI 96814; (808)949-5564.**

IDAHO

Preston

Ross WB7BYZ has the largest stock of amateur gear in the Intermountain West and the best prices. Call me for all your ham needs. **ROSS DISTRIBUTING, 78 S. State, Preston ID 83263; (208)852-0830.**

MASSACHUSETTS

Littleton

Reliable hamstore servicing New England. Full line of Kenwood and ICOM stocked and serviced. AEA, ARRL Publications, Anphenol, Alpha Delta, Austin, Avanti, Alinco, Ameco, Bencher, B&W, Cushcraft, Carol Cable, Daiwa, Hustler, KLM, Kenpro, Larsen, Rohn, RF Concepts, Tokyo Hy-power, Trac Keyers, Vibroplex, Welz, etc. TEL-COM, INC., 675 Great Road (Rt. 119) Littleton MA 01460; (617)486-3400, (3040).

MISSOURI

St. Louis

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes…Electronically speaking, Gateway's got it! M-F 9-5:30 Sat. 9-5. **GATEWAY ELECTRONICS, 8123 Page Blvd., St. Louis MO 63130; (314)427-6116.**

NEW HAMPSHIRE

Derry

Serving the ham community with new and used equipment. We stock and service most major lines: AEA, Astron, B&W, Cushcraft, Encomm, Hy-Gain, Hustler, ICOM, Kenwood, KLM, Larsen, Mirage, Mosley; books, rotors, cable and connectors. Business hours Mon.-Sat. 10-5, Thursday 10-7. Closed Sun./Holidays. **RIVENDELL ELECTRONICS, 8 Londonderry Road, Derry NH 03038; (603)434-5371.**

NEW JERSEY

Lyndhurst

Finally a ham store in NJ. Located ¼ mile south of Rt. 3. Mon.-Wed. 11:30-7:30, Thursday 11:30-9, Friday 11:30-7:30, and Saturday 9-3. Visa/MC. **ABARIS SYSTEMS, 276 Oriental Place, Lyndhurst NJ 07071; (201)939-0015.**

NEW YORK

Jamestown

Western New York's finest amateur radio dealer featuring ICOM–Larsen–AEA–Hamtronics–Astron. New and used gear. **VHF COMMUNICATIONS, 915 North Main St., Jamestown NY 14701, (716)664-6345.**

New York

New York City's Largest Full Service Ham and commercial Radio Store. **BARRY ELECTRONICS, 512 Broadway, New York NY 10012; (212)925-7000.**

NORTH CAROLINA

Greensboro

9a.m. to 7p.m. Closed Monday. ICOM our specialty–Sales & Service. **F&M ELECTRONICS, 3520 Rockingham Road, Greensboro NC 27407; (919)299-3437.**

OHIO

Columbus

Central Ohio's full-line authorized dealer for Kenwood, ICOM, Yaesu, Ten-Tec, Info-Tech, Japan Radio, AEA, Cushcraft, Hustler, and Butternut. New and used equipment on display and operational in our 4000 sq.ft. store. Large SWL department, too. **UNIVERSAL AMATEUR RADIO, 1280 Aida Drive, Reynoldsburg (Columbus) OH 43068; (614)866-4267.**

PENNSYLVANIA

Trevose

Same Location for over 38 years. **HAMTRONICS, DIV. OF TREVOSE ELECTRONICS, 4033 Brownsville Road, Trevose PA 19047; (215)357-1400.**

TENNESSEE

Memphis

M-F 9-5; Sat 9-12; Kenwood, ICOM, Ten-Tec, Cushcraft, Hy-Gain, Hustler, Larsen, AEA, Mirage, Ameritron, etc. **MEMPHIS AMATEUR ELECTRONICS, 1465 Wells Station Road, Memphis TN 38108; Call Toll Free: (800)238-6168.**

TEXAS

Dallas

In Dallas since 1960. We feature Kenwood, ICOM, Yaesu, AEA, Butternut, Rohn, amateur publications, and a full line of accessories. Factory authorized Kenwood Service Center. **ELECTRONIC CENTER, INC., 2809 Ross Ave., Dallas TX 75201; (214)526-2023.**

Houston

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes…Electronically speaking, Gateway's got it! M-F 9-5:30 Sat. 9-5.**GATEWAY ELECTRONICS, 10645 Richmond Ave. #100, Houston TX 77042; (713)978-6575.**

Southwest Houston

Full line of Equipment and Accessories, in-house service, Texas #1 Ten Tec Dealer! MISSION COMMUNICATIONS, 11903 Alief-Clodine, Suite 500, Houston TX 77082; (713)879-7764.

DEALERS

Your company name and message can contain up to 25 words for as little as $199 yearly (prepaid), or $50 for three months (prepaid). No mention of mail-order business permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the April '88 issue must be in our hands by February 1st. Mail to *73 Amateur Radio*, Hope Currier, WGE Center, Peterborough, NH 03458.

73 Advertiser's Product Index

A convenient service for our Readers.

RS#	Company	Page
AMPLIFIERS		
314	Ameritron	83
263	Dentron	80
•	ICOM	Cover II,47,93
•	Kenwood	Cover IV, 7,8,10
99	Communications Concepts	48
151	Naval Electronics	72
51	Spectrum Communications	19
165	Yaesu	Cover III
ANTENNAS, CABLE AND ACCESSORIES		
315	AEA	30
314	Ameritron	83
89	Antennas West	17
90	Antennas West	71
236	Antennas West	55
302	Antennas West	57
303	Antennas West	71
304	Antennas West	80
122	Antenna Systems	84
53	Barker and Williamson	72
42	Bilal	55
160	Com-Rad Industries	52
313	Cubex	80
263	Dentron	80
•	Down East Microwave	46
202	Electron Processing	47
308	Gem Quad	43
72	Glen Martin	51
169	Grove Enterprises	48
•	Heath Co	51
269	Hustler	2
204	Hustler	48
•	ICOM	Cover II,47,93
•	Jo Gunn	80
•	Kenwood	Cover IV,7,8,10
24	MFJ	3
101	Maxcom	70
163	Mobile Mark	66
305	Ed Noll W3FQJ	17
167	Orion Hi-Tech	46
30	QEP	17
115	RF Connection	57
150	Radio Works	46
274	Smiley Antennas	76
183	Spectrum International	65
134	Spi-Ro Manufacturing	43
136	Unadilla	46
38	W9INN Antennas	80
165	Yaesu	Cover III
BOOKS, MAGAZINES, QSL CARDS, TAPES, COURSES		
•	ARRL	97
288	Amateur Radio School	71
11	CTM	58
157	Cleveland Institute	51
234	Computing Across America	61
128	Electronics Book Club	45
58	Fox Tango	23
201	Gordon West Radio School	47
97	International Radio	71
241	Media Mentors	49
312	NRI	29
235	N6KW QSL Cards	80
31	Radio Amateur Callbook	23
69	Spec-Com Journal	55
203	Tiare Publications	47
•	W5YI	23
•	73 Magazine	17,53,58,39,104

RS#	Company	Page
REPEATERS, CONTROLLERS, ETC		
1	Advanced Computer Control	94
12	Connect Systems	1
10	Communications Specialists	92
306	Creative Control	46
•	Hamtronics	25
•	ICOM	Cover II,47,93
47	Maggiore Electronic Lab	72
295	Micro Control Specialties	79
95	S-Comm	66
51	Spectrum Communications	19
TRANSCEIVERS, RECEIVERS		
279	ACE	51
65	AEA	18
243	AXM Inc	46
•	Heath Co	51
•	ICOM	Cover II,47,93
•	Kenwood	Cover IV,7,8,10
•	PC Electronics	55
•	RF Parts	49,66
208	RF Parts	48
165	Yaesu	Cover III
KITS		
194	All Electronics	89
•	CBC International	71
•	DB Electronics	55
311	Devcom	57
•	Giehl Electronics	80
•	Hamtronics	25
•	Heath Co	51
34	Ramsey Electronics	67
POWER SUPPLIES, BATTERIES		
89	Antennas West	17
90	Antennas West	71
236	Antennas West	55
302	Antennas West	57
303	Antennas West	71
304	Antennas West	80
16	Astron	36
311	Devcom	57
•	ICOM	Cover II,47,93
•	Kenwood	Cover IV,7,8,10
68	Periphex	84
165	Yaesu	Cover III
112	E.H. Yost	80
COMPONENTS		
194	All Electronics	89
4	Amidon Associates	65
53	Barker and Williamson	72
•	DB Electronics	55
75	Fair Radio Sales	57
22	Jan Crystals	84
252	Midland Technologies	57
TOOLS, TEST EQUIPMENT		
93	American Reliance	97
186	Coaxial Dynamics	97
310	Davie Tech	17
43	EEB	98
•	Kenwood	Cover IV,7,8,10
24	MFJ	3
205	Penntek Instruments	48
34	Ramsey Electronics	67

RS#	Company	Page
79	Vanguard Labs	80
165	Yaesu	Cover III
KEYS, KEYERS		
24	MFJ	3
MISC ACCESSORIES		
65	AEA	18
10	Communications Specialists	92
291	Electron Processing	89
58	Fox Tango	23
169	Grove Enterprises	48
•	ICOM	Cover II,47,93
97	International Radio	71
61	Inventron	71
248	Jeff's Signs	52
•	Kenwood	Cover IV,7,8,10
•	Maryland Monogram	84
55	Meadowlake Corp	57
127	Motron Electronics	57
178	Pacific Cable	17
73	S-F Amateur Radio	71
•	Star Circuits	52
RETAILERS		
•	Amateur Electronic Supply	40
•	Associated Radio	84
41	Barry Electronics	33
92	Burghardt Amateur Radio	79
121	Communications Electronics	21
•	Down East Microwave	46
43	EEB	98
133	EGE	95
169	Grove Enterprises	48
•	Ham Station	83
309	Hamtronics	43
272	Jun's	49
25	Madison Electronics	23
162	Michigan Radio	29
187	Mission Consulting	57
292	Omar Electronics	17
29	PX Shack	80
254	Ross Distributing	57
100	The Spectrum	57
298	VHF Communications	71
COMPUTER HARDWARE AND SOFTWARE		
80	Compumax	65
311	Devcom	57
•	Engineering Consulting	58
249	ExpertQ	71
175	Haltronix	55
153	Morlan Software	48
152	PacCom	52
•	Silicon Solutions	39
307	True Value Software	46
PACKET EQUIPMENT		
65	AEA	18
239	DRSI	41
311	Devcom	57
291	Electron Proccessing	89
17	GLB Electronics	79
206	MFJ	48
152	PacCom	52
HAMVENTIONS		
301	Charlotte Hamfest	41
•	Dayton Hamvention	82

☐**Yes!** **I want to subscribe! Send me 1 year (12 issues) of *73* at the low rate of $19.97. (Save over $15 off the cover price.)**

Name _____ Call _____

Address _____

City _____ State _____ Zip _____

☐AE ☐MC ☐VISA ☐Check Enclosed

Card# _____ Exp. Date _____

For faster service call 1-800-722-7790.
In NH, call 1-525-4201.

March 1988—card valid until April 1988. You make the *73* supporting advertisers very happy when you're interested in them . . . Wayne

FREE INFORMATION
READER SERVICE CARD

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310
311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370
371	372	373	374	375	376	377	378	379	380
381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400

Reader Service: To receive more information on the products advertised in this issue of *73*, circle the appropriate number. Please allow 6 weeks for processing of inquiry and first issue. Offer valid in the U.S. and possessions for a limited time only.

3836R

73 Magazine Product Report Card

Please rate any ham gear you're using from (0) poor to (9) superb.

Manufacturer	Model	Your Rating	When Purchased	Notes
1.				
2.				
3.				
4.				
5.				

Comments: _____

Your name, call, complete address: _____

☐Please enter my subscription to **73 Magazine** for one year at $19.97. (Base rate: $24.97) 3836PR

☐AE ☐MC ☐VISA ☐Check Enclosed. Card# _____ Exp. Date _____

Please allow 4-6 weeks for processing of first issue.

FEEDBACK

The Pitch: *73* wants to know what you want to read. Help us by voting on this month's features and columns—you'll find their numbers in the Feedback box on the page preceding this card.

The Payoff: Each month we'll draw a card at random. If yours is picked, you'll receive a one-year subscription (or extension) to *73*.

Article #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Great																									
OK																									
No Way																									

Article #	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Great																									
OK																									
No Way																									

Name _____

Address _____

City _____ State _____ Zip _____

I'd like to see more _____

I'd like to see less _____

3836F

Place
Stamp
Here

73 AMATEUR RADIO

Reader Service Management Department
P.O. Box 326
Dalton, MA 01227-0326

Place
Stamp
Here

73 AMATEUR RADIO

Editorial Office
WGE CENTER
70 Route 202 North
Peterborough, NH 03458-9995

Place
Stamp
Here

73 AMATEUR RADIO

Editorial Office
WGE CENTER
70 RTE. 202 NORTH
PETERBOROUGH, NH 03458-9995

ATTENTION HAMS!

SUCTION CUP MOUNT VAK-TENNA!

Only $29.95

IDEAL FOR APARTMENTS OR OFFICES!

Mount this antenna to your window for the BEST coverage. Two VERY powerful suction cups hold firmly for weeks. Whips telescope to 79" yet fold to only 12". **This antenna is a MUST for people who travel!** Receives 30-500 MHz or transmit 70-230 MHz with up to 50 watts! Complete with 15' of RG58 coax and choice of PL259, BNC, Motorola or F connector (specify connector when ordering).

Kathy Sez: "These products are A-OK!"

Ultimate Mobile Speaker

Only $29.95

MOUNTS TO GLASS WITH SUCTION CUPS!

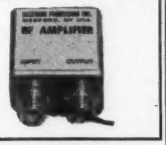
Finally a speaker you can put where YOU want it! Place it near your ear for fine armchair copy, even in your car! Specially designed suction cups hold for weeks yet remove easily for storage. Complete with 5' cable and either Mini or Sub-Mini plug (specify when ordering).

SIGNAL INTENSIFIERS

Priced from $29.95

A HEARING AID FOR YOUR RECEIVER OR SCANNER!

- The State of the Art in WIDEBAND preamps!
- Make small antennas perform like BIG ones!
- Fully Assembled and BUILT TO LAST!
- 110 VAC or 12 VDC powered!
- VHF/UHF or MF/HF available!
- Many models! Send for specs!



Add $3 Shipping/Handling. NY add 7.5% Sales Tax.

ELECTRON PROCESSING, INC
P.O. BOX 708
MEDFORD, NY 11763
(516) 764-9798

SATISFACTION GUARANTEED! Order any product (except software) from EPI and if not satisfied return it within 15 days for a full refund (less shipping/handling).

SEND FOR MORE DETAILS! US MADE!

CIRCLE 291 ON READER SERVICE CARD

SEND FOR FREE 1987 CATALOG... 48 PAGES!

★QUALITY PARTS ★DISCOUNT PRICES ★FAST SHIPPING!

ALL ELECTRONICS CORP.

ALL ELECTRONICS CORP.

BLACKLIGHT ASSEMBLY

Complete, functioning assembly includes ballast, on-off switch, power cord, sockets and F4T5-BL blacklight. Mounted on a 7 1/8" X 3 1/8" metal plate. Use for special effects lighting or erasing EPROMS. CAT# BLTA $10.00 EACH

1mA METER

Modutec 0-1 mA signal strength meter with KLM logo. 1/4" X 1 3/4" X 7/8" deep. CAT# MET-2 $2.00 each

VIC 20 MOTHERBOARD

26 IC's including 6502A and 6560. Not guaranteed but great for replacement parts or experimentation. CAT # VIC-20 $15.00 each

SWITCHING POWER SUPPLY

Compact, well regulated switching power supply designed to power Texas Instruments computer equipment.
INPUT: 14-25 vac @ 1 amp
OUTPUT: +12 vdc @ 350 ma.
+5 vdc @ 1.2 amp
-5 vdc @ 200 ma.
SIZE: 4 3/4" square.
CAT# PS-30 $9.50 each

XEON FLASH TUBE

3/4" X 1/8" dia.
CAT# FLT-1 2 for $1.00

THIRD TAIL LIGHT

Sleek high-tech lamp assembly. Could be used as a third auto tail light, emegency warning light, or special-effects lamp. Red reflective lens is 2 3/4" X 5 1/2" is mounted on a 4" high pedestal with up-down swivel adjustment. Includes 12 V replaceable bulb

CAT# TLB $3.95 each

LED'S

Jumbo T 1-3/4 (5 mm)
RED
CAT# LED-1
10 for $1.50

GREEN
CAT# LED-2
10 for $2.00

YELLOW
CAT# LED-3
10 for $2.00

TWO PIECE HOLDERS FOR ABOVE L.E.D.S
CAT# HLED
10 for 65c
100 for $5.00

MINI PUSH BUTTON

S.P.S.T. momentary. Push to make.
CAT# MPB-1
10 for $3.25

TELEPHONE COUPLING TRANSFORMER

Stancor # TTCP-8 600 ohms C.T. to 600 ohms C.T. P.C. board mount. 3/4" X 5/8" X 3/4"
CAT# TCTX8 $2.50

NI-CAD CHARGER/ TESTER

Will charge most every size Ni-Cad battery available.
CAT# UNCC-N $15.00

RECHARGEABLE NI-CAD BATTERIES

AAA SIZE 1.25V	180mAH	$2.25
AA SIZE 1.25V	500mAh	$2.00
AA WITH SOLDER TABS		$2.20
C SIZE 1.2V	1200mAH	$4.25
SUB-C SIZE SOLDER TABS		$4.25
D SIZE 1.2V	1200mAH	$4.25

TOLL FREE ORDERS
800-826-5432
INFO • (818) 904-0524
FAX - (818) 781-2653

OUR NEW ADDRESS IS:
P.O. BOX 567
VAN NUYS, CA 91408

VISA MasterCard

QUANTITIES LIMITED MINIMUM ORDERS $10.00 CALIF. ADD SALES TAX USA: $3.00 SHIPPING NO C.O.D.! FOREIGN ORDERS INCLUDE SUFFICIENT SHIPPING

CIRCLE 194 ON READER SERVICE CARD

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we've decided to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed below. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

"What's in it for me?" comes the cry from our faithful readers. Beside the knowledge that you're helping us find out what you like (and don't like), we'll draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save some money on stamps, why not fill out the Reader Service card, the Product Report card, and the Feedback card and put them in an envelope. Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 22 cents!

Feedback #	Title
1	Welcome Newcomers
2	Never Say Die
3	QRX
4	Down East Microwave
5	Winnebiko
6	Cheap 10m Beam
7	Review: Direction Finder
8	Heath SB200-220
9	10m Meteor Scatter
10	Review: Larsen Antenna
11	Ultra Convenient Antenna
12	Review: Comrade's Charger
13	Antennas in Spring
14	Review: 4-element Yagi
15	Book Review
16	Review:Create Yagi
17	Review: MAXCOM
18	New Products
19	Telegraph Trail
20	ATV
21	Barter & Buy
22	Propagation
23	Aerial View
24	Hamsats
25	Special Events
26	QRP
27	Book Review
28	Above & Beyond
29	Circuits
30	RTTY
31	DX
32	Fun
33	Dealer Directory
34	Ad Index
35	73 International
36	Looking West
37	QTH DX
38	Letters
39	Op Ed
40	Index: 3/88
41	Packet Talk

73 INTERNATIONAL

Edited by Richard Phenix

Notes from FN42

새해를 맞이하여 행운과 만수무강을 빕니다.

May the New Year
Bring you a Basketful of Happiness and Joy!

We're off to a good start on the task of untangling the whats, whys, and wherefores of applications for permits to operate in countries other than your own. In the box you will find the headings **Change, Comments, and Special Requirements.** Under the first will be changes to make on the application form published in January on page 78. (If you don't have this, send us an SASE and ask for a copy.)

These result from suggestions received, which seem to be best for a maximum number of countries and hams. The "comments" will include suggestions which seem to make a lot of sense but may not conform to the present requirements of most countries. If you agree with any, it is up to you to work with your country's officials to modify any requirements you believe could be changed. Keep us informed.

Reports from SV1IW and XE1MKT next month. (New address for Mark Toutjian: Apartado Postal 311, 56101 Texcoco, Mexico.)

Events in March for you to use when greeting hams around the world: Independence Days will be celebrated in Morocco (3rd), Ghana (6th), Tunisia (20th), Greece (25th), and Bangladesh (26th); National Days: Sudan (Unity)—3, Syrian—8, Tibet—10, Grenada—13, and Malta—31. March 1—Heroes Day, Paraguay; 2—Peasants Day, Burma; 6—International Womans Day, USSR; 9—Decoration Day, Liberia; 10—Labor Day, South Korea; 12—Commonwealth Day, Swaziland; 13—Mother's Day, Great Britain, which has its Commonwealth Day on the 14th; 17—St. Patrick's Day, Ireland and USA; 21—Vernal Equinox Day, celebrated in Japan; 23—Pakistan Day; 27—Armed Forces Day, Burma; 28—British Evacuation Day, Libya; 29—Youth Day in Taiwan.

COMMENTS

Brazil: Does not require equipment data, band, or emission info; grants highest class of license in Brazil to any class of licensee from reciprocal country; expiration date is expiration date of your license or last day of stay in Brazil. **From PY1APS.** Israel: Our permit fee is US$10. New streamlined process being developed now. Details will follow. Suggest the Universal form provide spaces for only those items universally required, and that all additional requirements be given in a numbered list keyed to the country(ies) to which they apply. **From 4X1MK.** *[Good thinking!—Ed.]*

Republic of China (Taiwan): No reciprocal agreements, but on a one-time, temporary basis, an individual ham will be "welcomed to operate in the station BV2A/BV2B in my presence...with own call-sign/BV, or act as my second operator." (Send him a photocopy of your license.) Expedition groups, however, could use the "universal" form (send two months in advance) to the authorities with a list of operators and detailed data on each piece of equipment. **From Tim Chen BV2A/BV2B, PO Box 30-547, Taipei, Taiwan, Republic of China.** *[See Tim's column, below.—Ed]*

SPECIAL REQUIREMENTS

New Zealand: Description of self: Height; color of eyes and hair; complexion. No fee for reciprocal country's hams. Novice class licenses DO NOT qualify. Send application to *Post Office Headquarters, Wellington, NZ.* **From ZL2VR.** *[NZ's form and process very simple, straightforward, and fast, but Novices had better upgrade!—Ed]*

UNIVERSAL PERMIT APPLICATION
(Refer to Application form in January issue, p. 78)

CHANGES

Add: Submit 3 copies of application. And from **CT4UE**, who also thinks this a good idea, the first point should be: (1)The rules of Radio Amateur Regulations in force in the country of operation. (The present points now become 2 through 5.)

Delete: (No deletions yet.)

Change: (No changes yet, but see Comments.)

"May the New Year Bring you a Basketful of Happiness and Joy!"
Byong Joo Cho HL5AP

Roundup

Australia. Details next month; Australia celebrates its Bicentenary this year. VK4MU (WIA Queensland Division Secretary) reports much confusion at EXPO and acres of red tape, but VK4QA is hopeful that VI88XPO will be heard between April 30 and October 30. VI88QLD will be heard all year, and Australian hams are allowed to use the special prefix, AX. VK3YJ reports that the radio club, Polonia (VK3CRP), using VI88, was active January 4 to March 4. (QSL Manager at PO Box 2376, Richmond South, Victoria, 3121 Australia; send SAE and two IRCs.)

For the fourth month running, an interesting emergency-at-sea story from Norfolk Island's VK9NL will have to be held over! The event happened in July, 1987, and involved some good hamming by John VK9JA, Norfolk Island officials, and the Royal Australian Navy's *HMS Whyalla.* Keep watching for it!

Canada. "Life is being in the right place at the right time," says **Beverley Oda**, a Japanese-Canadian recently appointed to the Canadian Radio-Television Telecommunications Commission. She sees her position as an opportunity to advocate her lifelong interest in multicultural TV. (From *World Press Review*, 1/88.)

Ecuador. Last October, the Guayaquil Radio Club sponsored the second annual International DX-HC Middle of the World Contest "to tighten the friendship between the HC and the rest of the world's ham radio operators." Winners of the 1986 contest (1st, 2nd, and 3rd place) were: 40m—Victor H. Botero A. HK5ISX/N, Bernardo E. Delgado HJ8MPU, Jairo Vargas S. HJ5MQZ; 20m—Jimmy Alonso S. TI2TWR, Ricardo Munoz H. XE1AFQ, Leonor Shamah HP1XLI; Multiband—George A. Padron YV1CLM, Jesus A. Ustariz HK2DBC, Francisco G. Caparroz HR1FC. For 1988 rules write the club at PO Box 5757, Guayaquil, Ecuador.

USSR. Excerpts from *Perestroika,* the recent book by Soviet Communist Party General Secretary Mikhail Gorbachev, suggest that his stated policy of *glasnost* (openness) could herald relaxed policies in ham radio matters.

Stating that the USSR is "a unique community of more than 100 nations and nationalities...for 280 million people on a territory forming one-sixth of the earth." The USSR encountered serious difficulties in the 1970s. To solve these problems; " the only logical conclusion [which was] announced at the April 1985 Plenary Meeting of the Central Committee, which inaugurated the new strategy of *perestroika*....

"Perestroika is a revolution [requiring] the demolition of all that is obsolete, stagnant and hinders progress." To Western eyes those words clearly spell out "more communication, more sharing of ideas, views, and thoughts." Time will tell if the words meant the same to Mr. Gorbachev. Watch this column for a red flag with hammer and sickle and a Russian correspondent! (Quotes taken from "The World According to Gorbachev," *Washington Post National Weekly Edition*, 12/21/87.)

[See also under Israel, below.
—Ed.]

CYPRUS

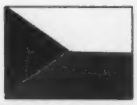
Aris Kaponides 5B4JE
PO Box 1723
Limassol
Cyprus

C4LWF, the special Limassol Wine Festival station, did not operate last September due to lack of support from the organizers, and for the same reason about 300 QSL cards and certificates from the 1986 operation cannot be dispatched. From June through December the Cyprus Amateur Society did have authorization to use the H25 special prefix to celebrate its 25th anniversary. As far as I know, it was used by 5B4SA, SC, QA, and JE.

The number of Cyprus amateurs seems to be increasing, but the really active ones do not exceed the dozen mark. Avid DXers are Laurence 5B4SA, Mike -TI, Akis -OA, Phidias -OK, Christos -QA, and myself. The club stations in the main cities are getting organized and all of them now have a tribander (present from CARS) and are activated at least once a week. In response to inquiries from abroad about top band activity: as far as I know, the only SSB on 160m is 5B4OA; most of our DXers are active on 80 and 40 from time to time. The ZC4 stations at the British bases are quite active, especially on CW. Number 1 DX chaser, active on all bands, is Adrian ZC4AP. Others include Dave -DR, Ian -IM, Alan -AB, and Nick -EE. Last October ZC4DX was operated from the Episkopi base club station by ZC4AP, -SA, Spyros -MF, and Dov 4Z4DX for the WPX contest.

Of great interest to VHFers is long-distance communication via sporadic E. Undoubtedly Nick 5B4AZ is number 1 with this—a real hounddog in smelling out the openings. Last June he again worked about 10 Italian stations, and for the first time a French station using an FT-2900 and telescopic whip antenna. During the first week in June several 5B4 stations are listening and calling on 144.3 MHz—VHFers be alert and stretch your ears!

Nick 5B4CV is our only serious SSTVer. He was first in Cyprus and 5th worldwide in the 1987 SSTV contest. Nick plans to homebrew some color converter now.



CZECHOSLOVAKIA

Rudolf (Rudy) Karaba OK3CMZ
(OK3KFO ARC)
Gogol'ova 1882
955 01 Topol'cany
Czechoslovakia

•Every December, the Minister of Telecommunications in Prague announces the best and most active radioamateurs. In 1986, on the occasion of the 35th Anniversary of the Military and Sports Association, he awarded honors to the best radioamateurs and gave some of them the title, Master of Sports.

•1986 shortwave champions (the biggest world and local contests), with 75 being the maximum points possible, were OK6RA (operator OK2FD) with 69 points, and OK1VD and OK1DBM each with 66 points; for collective stations: OK5W (OK1KSO) with 75 points, OK3KAG, 69, and OK1KQJ with 50.

•Sarajevo, Yugoslavia, hosted the 3rd World Championships of Radio Orientation Races in September of 1986. Some 1200 contestants came from Austria, Bulgaria, Belgium, Czechoslovakia, China, Japan, North Korea, South Korea, Hungary, Norway, Poland, Romania, Sweden, Switzerland, and Yugoslavia. In very difficult competitions, Czechoslovakia won six medals, three of them gold.

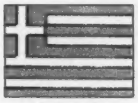
•That December, Engineer Jaroslav Losinsky, Deputy Minister of Telecommunications, announced that beginning in January, 1987, the 18- and 24-MHz bands would be freed for Czechoslovak amateurs; there were other changes also: 18.068–18.168 kHz and 24.890–24.990 kHz—operation mode A1, A3, A5; the bands 1.75 and 1.95 MHz changed to segments 1.810 to 2.0 MHz. Input of 500 watts maximum 1.810 to 1.850, and 15 watts 1.850 to 2.0.

Stefan OK3CGP and his 1984 ARRL International DX Contest award, QRP category.

•Since February 2nd of last year, from Monday through Friday at 0605 and 2305 UTC Czech amateurs have been able to tune in on the commercial station, Star, to get a forecast of propagation of electromagnetic waves (relative number of solar spots, solar radium flow, and data on geomagnetic index A_k).

•Every November from the 1st to the 15th, there is a contest on behalf of Czechoslovak/Russian friendship. I will report the winners of this year's event to you.

•Orbital Station MIR is not a radio amateur satellite, but in the future Soviet cosmonauts will be heard from. The station callsign will be U1MIR; it will operate FM on 145,000 and 574 MHz with a 5-watt output and a multidirectional antenna; the inclination of MIR's orbit is only slightly different from that of the FO12 satellite. The 5-watt output will be sufficient for Earth stations, antenna with 10 decibels gain and a receiver with sensitiveness of 0.5 microvolts.



GREECE

Manos Darkadakis SV1IW
Box 23051
11210 Athens
Greece

[SV1IW writes that the Technical University of Athens is not at the address given in last November's International Roundup item on Dr. Agis Sarakinos. Quite right! Apologies to that institution for moving it into SV1ACS's own space.—Ed.]

Up until now you needed to be a member of the one and only International Amateur Radio Union (RAAG) before you could get an amateur license in Greece. Well, as this is written [October, 1987] a change has been sent to the Parliament so that you do not have to be a member. I personally think that is more fair. I have also some information that a new club is going to see the light of day here in Athens, of people who have a common love of Specialized Communications. I guess that means FAX, ATV, Packet, and maybe more.

Speaking of packet, here in Athens, where there are about ten people capable of this mode, we are trying to organize the first Greek LAN. This is most difficult because the people have just one computer working on a time-sharing basis for a lot of things, packet being one.

I hope that with the evaluation of a German-made program for the popular C-64 computer things will change, as this excellent program does a software emulation of a TNC and needs only a small modem board like the one with the AM7910 chip in ARRL's *Handbook* for example. If we raise some activity with it, there is a small PBBS program and maildrop to further promote interest and more activity. I would appreciate hearing from others, anywhere in the world, where packet activity is slow, with ideas and suggestions. We are short of literature covering updates and mods and improvements on popular TNCs.

Our RO repeater is still out of order, and as we are at winter's front door there is no hope it can be repaired before the snows. This is the one with its own onboard computer to check its functions, but this is proving to be the main disadvantage as only one person can repair it. It's been off for nearly a year now—a great inconvenience in this mountainous country.

ISRAEL

Ron Gang 4X1MK
Kibbutz Urim
Negev M.P.O. 85530
Israel

[Note that Ron 4Z4MK is now 4X1MK!—The rules of, and suggested log sheet for, the April contest honoring the 40th anniversary of Israel's independence, mentioned briefly last month, now may be obtained from us. US hams: send an SASE with your request.—Ed]

Novice Enhancement. Principle agreement has been reached between the Ministry of Communications and the Israel Amateur Radio Club to grant voice privileges to Grade C (Novice) li-

Dynamite Discovery

Communications Specialists' latest excavation brings to light yet another dynamite discovery—our new dip switch programmable SD-1000. No need to tunnel your way through Two-Tone Sequential decoding anymore. We've mined this amazing unit! Now, for the first time, you can stock one unit that will decode all calls in a 1000-call paging system with ±.2Hz crystal accuracy. The EEPROM onboard memory can even be programmed for custom tones, and every unit includes group call. Universal switched outputs control your call light, squelch gate and horn. The SD-1000 can also generate CTCSS and decode Two-Tone Sequential. Its miniature size of 2.0″ x 1.25″ x .4″ is no minor fact either, as it's a flawless companion for our PE-1000 Paging Encoder. We ensure one-day delivery and our one-year standard warranty. Tap the rich vein of Communications Specialists and unearth the SD-1000 or other fine gems.

$59.95 each

MasterCard VISA

COMMUNICATIONS SPECIALISTS, INC.
426 West Taft Avenue • Orange, CA 92665-4296
Local (714) 998-3021 • FAX (714) 974-3420
Entire U.S.A. 1-800-854-0547

CIRCLE 10 ON READER SERVICE CARD

ICOM VERSATILITY

ICOM's versatile family of handhelds provides superb performance and reliability to keep you talking. With an incomparable full line of interchangeable accessories and options, they're suited to fit your every radio need.

2 METERS

ICOM's advanced IC-02AT, compact IC-μ2AT Micro, and rugged IC-2AT dominate the 2-meter bands from 139.0-163.0MHz.

220MHz

ICOM's deluxe IC-03AT and dependable IC-3AT are the perfect choices for 220.00-224.995MHz.

440MHz

ICOM's outstanding IC-04AT, IC-μ4AT, and Micro IC-4AT, have you covered to 440.00-449.995MHz.

1.2GHz

Exclusively ICOM, the 1260.0-1299.990MHz band is owned by the unique, full-featured IC-12AT.

ACCESSORIES

With headsets complete with Vox or PTT control box, a large variety of interchangeable battery packs, leather cases and rapid desktop chargers—the versatile ICOM handhelds will keep you talking. Meet the full family at your local, quality ICOM dealer.

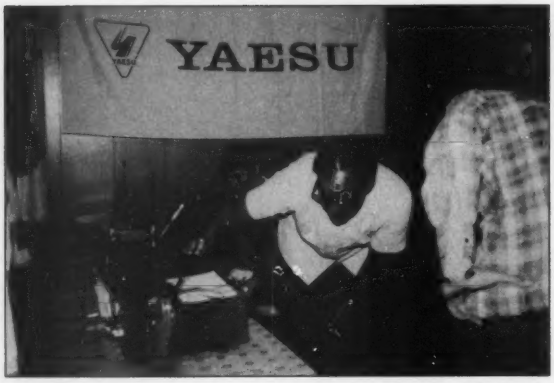
ICOM

ICOM America, Inc.
2380-116th Ave. N.E., Bellevue, WA 98004
Customer Service Hotline (206) 454-7619
3150 Premier Drive, Suite 126, Irving, TX 75063
1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
ICOM CANADA, A Division of ICOM America, Inc.,
3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4
Canada

All stated specifications are approximate and subject to change without notice or obligation.
All ICOM radios significantly exceed FCC regulations limiting spurious emissions. HANDHELDS1187.

portion of the Grade B (General) class exam dealing with regulations and on-the-air operating will be added to the Novice exam and must be passed before present Novices can operate voice.

The Novice license is renewable, and presently allows 15W output on CW only between 7.000 and 7.050 MHz and 21.100 and 21.150 MHz. The exam consists of a 6-wpm code test and a theory portion similar in scope to the US Novice test. Those passing are given a 4Z9 call with a three-letter suffix. Previously, a Novice could have been 4X4NXX, 4Z4NXX, or 4X6NXX, with the N dropping out once the General exam had been passed. Now the previous prefixes will belong only to Grade B licenses and old Novices will be reissued 4Z9 calls. Grade A licensees are being given the 4X1 prefix, so that for better or worse all callsigns now will indicate class of license.



4Z4ZB, active packeteer and Oscar phase III C operator, checks gear at a hamfest. 4X6LU, right, looks on, and unidentified young ham looks wistfully at "dream" gear.

PL Reminder. The IARC has decided that beginning now all two-meter repeaters in Israel will be accessed only by carriers with a 192.8 Hz subaudible tone added. This has become necessary, unfortunately, because of the proliferation of clandestine signals on the 2m band from north of the border. Visiting hams, who are welcome guests on our repeaters, are reminded to make sure their handies are equipped with a PL tone generator.

The Iron Curtain Rises? Since the Six Day War, Israeli amateurs have been boycotted by the Soviet Union and East Germany—hams from there have been forbidden to work 4X or 4Z stations. In the last few months, however, East German hams have begun to work us freely on all bands at all times, and we were told to QSL via the bureau. Then Yitzhak 4X1FU (formerly 4X4FU) received two parcels of QSL cards from the East German bureau for 4X/4Y. That marked the first time in 20 years that we have had cards from that bureau! We hope that this enlightenment will continue. *[See USSR, under "Roundup," above.—Ed.]*

Packet News. Packet seems to be an accepted fact, with more and more stations getting in on the act. The IARC has allocated 1,000 shekels for enhancing the national network, which can be heard/seen almost around the clock, buzzing away on 144.675 MHz.

Two-meter Band Plan Adopted. With the increasing traffic on two meters, the IARC Executive saw fit to ratify the VHF band plan worked out by 4X4GE and 4X4GI. In accordance with the IARU's Region I spectrum accords, the band's two megahertz are divided so that the first 150 kHz are for CW only, with the addition on SSB up to 144.500. Only from there on up is FM allowed, channelizing the band in 25-kHz steps. 144.600–144.675—packet only; 144.700–144.775—repeater inputs; 144.900–144.990—for beacons; 145.000–145.775—FM simplex and repeater channels; and the top of the band, 145.800 up to 146.000 is reserved for the amateur satellite service exclusively. (144.000–.025—EME spectrum; 144.050—international CW calling frequency; 144.100—meteor scatter; 144.300—international SSB calling; 144.400—SSB meteor scatter.)

It is hoped that with the publication of this band plan confusion and unintentional interference will cease. Now if we could only bring this to the attention of the clandestine operators north of the border...! 73

"I convinced my club to buy a repeater controller from ACC and I'm glad I did."

Our group decided to upgrade our repeater system and I was the one asked to investigate.

We've always tried to have the best system around so it was time to make some changes. We needed a control system that was reliable, easy to hook up, cost-effective, and something that would free the technical guys for more interesting projects than just keeping the equipment running.

Everyone in the club put a few bucks into the pot and it was ours!

We've found the voice messages and telemetry make using the repeater more fun. The convenience of remote programming and automatic scheduled operation is remarkable. Not to mention the most sophisticated autopatch ever designed for amateur use. Later we added the Digital Voice Recorder for personalized IDs, bulletin boards, and voice mail.

ACC's products are state-of-the-art commercial quality and built to last. Workmanship so solid even the military uses them.

What impresses me even more, though, is the support we get from the staff at ACC - both before and after the sale. And they protect our investment through simple plug-in software and hardware upgrades . . . new features and capabilities that keep our club on top.

I feel good about recommending Advanced Computer Controls' repeater controllers. After all, it's *my* club's money that was spent and *my* reputation that was on the line.

acc advanced computer controls, inc.

2356 Walsh Avenue • Santa Clara, California (408) 727-3330

CIRCLE 1 ON READER SERVICE CARD

Join the Packet Racket!

Annual New Hampshire Store Sale March 5 & 6

Door prizes • Manufacturers' Reps • It's Better Than a Hamfest

ege inc™

DISCOUNTS FOR AMATEURS

EGE VIRGINIA
14803 Build America Drive, Bldg. B
Woodbridge, Virginia 22191
Information: (703) 643-1063
Service Dept: (703) 494-8750
Fax: (703) 494-3679

Store Hours: M-F: 10—6
Sat: 10—4

Order Hours: M-F 9—7
Sat: 10-4

EGE NEW ENGLAND
8 Stiles Road
Salem, New Hampshire 03079
New England (NH Included)
Toll Free: 800-444-0047
Info & Service: (603) 898-3750

Store Hours: MTuWF: 10—5
Th: 12—8; Sat: 10—4

LACOMBE DISTRIBUTORS
Our associate store
Davis & Jackson Road, P.O. Box 293
Lacombe, Louisiana 70445
Info & Service: (504) 882-5355

Terms: *No personal checks accepted. Prices do not include shipping. UPS COD fee: $2.35 per package. Prices are subject to change without notice or obligation. Products are not sold for evaluation. Authorized returns are subject to a 15% restocking and handling fee and credit will be issued for use on your next purchase. EGE supports the manufacturers' warranties. To get a copy of a warranty prior to purchase, call customer service at 703-643-1063 and it will be furnished at no cost.*

ege inc™

Winter Buyer's Guide/Catalog Available - Send $1.

Antennas

Amateur HF Bands
Cushcraft, Butternut, KLM, Mosley, Hy-Gain, B&W, Van Gorden, Hustler, Larsen, Antenna Specialists, Centurion, Smiley

Antennas in Stock
for Mobiles, Base Stations, and Handhelds

Everything from mini rubber duckies to huge monobanders

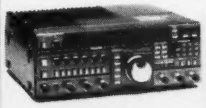
ASK FOR PACKAGE DEALS ON ANTENNAS AND ACCESSORIES

Also...
Antennas for Scanners, CBs, Marine, Commercial, and Short Wave Listening

YAESU

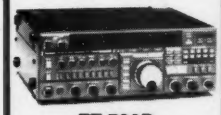
FT 23/33/73
Mini HTs for 2m, 220/440 MHz

FT 727R
2m/440 MHz Dual Band HT



FT-767GX
All Mode Transceiver with CAT System

FT-747GX
Good low-priced basic HF amateur rig.



FT-736R
VHF/UHF Base station for SSB, CW, FM on 2m, 440 MHz, and optional 6m, 220 MHz, or 1.2 GHz.

FT-757GX Mark II
HF Transceiver with General Coverage Receiver

ICOM

IC-781
Ultimate ham HF radio. CRT display & spectrum analyzer.

IC-761
New 160-10m transceiver with general coverage receive and many built-in features.

IC-28H
Tiny 2m with 45 W output

IC-275A
All-mode Transceiver

R-7000
General Coverage Receiver

Micro 2AT/4AT
Mini Handhelds for 2m or 440 MHz

IC-02AT/03AT/04AT
Handhelds for 2m/220/440

KENWOOD

TS-140S
HF Transceiver with General Coverage Receiver

TS-940S
HF Transciver with General Coverage Receiver

TM-221A/321A/421A
2m/220/440 MHz Mobiles

New Improved TH 215AT
2m Handheld

TH-25AT/45AT
Tiny HTs for 2m/440 MHz

R-5000
General Coverage Receiver

Kantronics Packet Units Now with WeatherFAX
Ask about KPC-2/4 & KAM All-Mode

Now Available
Heathkit®
Amateur Products
Call for details

TEN-TEC

Paragon
Amateur Transceiver with General Coverage Receiver

Corsair II
Model 561 HF Transceiver

ALINCO ELECTRONICS

ALR-22T
Compact 2m Mobile

ALD-24T
Compact Dual-band Mobile for 2m & 440 MHz

Towers

UNARCO-ROHN
TRI-EX
HY-GAIN
Ask for package quotes on complete tower assemblies including Phillystran, guy wire, antennas, rotators, etc.

ROTATORS
Kenpro, Alliance, Daiwa, Telex Hy-Gain

Computer Stuff

Packet Controllers
Kantronics and MFJ

Amateur Software
Ham Data Software for Commodore Computers
Ask for Descriptions

RTTY/Morse/Amtor
Hardware and Software and packages by Kantronics, Microlog, HAL, MFJ, & more

Accessories

AMPLIFIERS
Vocom, Daiwa, TE Systems, Amp Supply, Mirage, Alinco, Ameritron, Tokyo Hy-Power, RF Concepts

ANTENNA TUNERS
Amp Supply, Ameritron, MFJ

Switches, Couplers, Filters, Connectors, Mikes, Keyers, Paddles, Headsets, Clocks, Books, Power Supplies

More Radios

SONY
Receivers

REGENCY
BEARCAT
Scanners

CB RADIOS
Midland, Cobra, Uniden

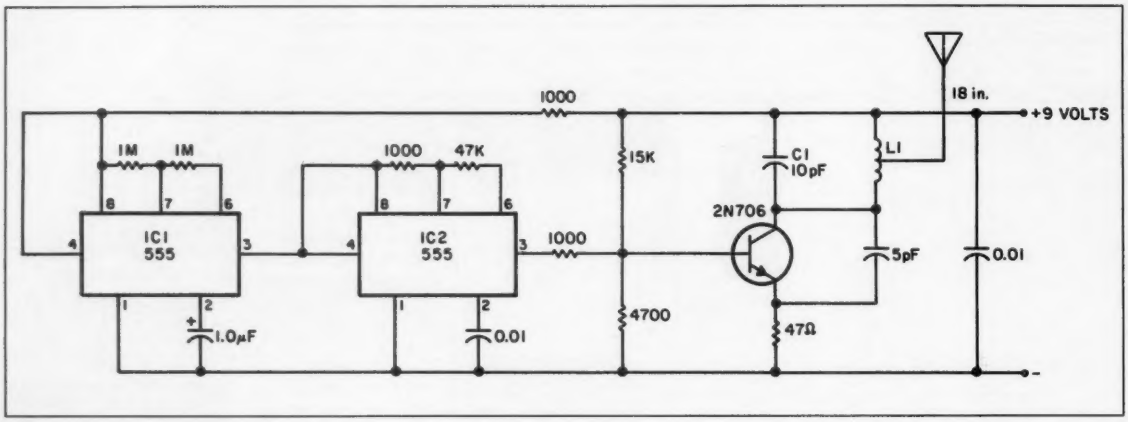
To Order Call Toll Free: 800-444-4799 **ege inc**

CIRCLE 133 ON READER SERVICE CARD

CIRCUITS

Great Ideas From Our Readers

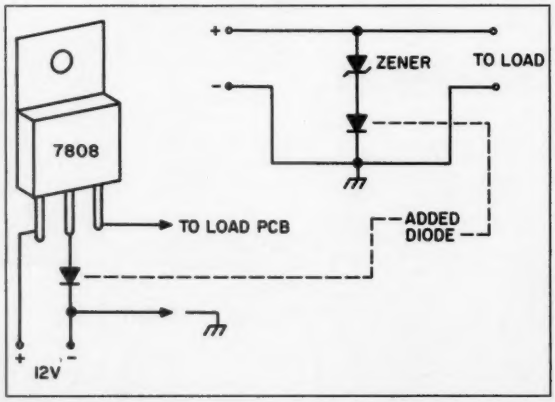
Have a quick'n'easy circuit idea? Share it and get a one year subscription or extension to *73*! Clearly mark all entries as submissions for Circuits to distinguish them from manuscripts. Send your entries to Circuits, 73 Magazine, Peterborough, NH 03458.



BEACON TRANSMITTER

This transmitter can be used for transmitter hunts, as a remote key finder, or radio telemetry (model rockets). It can be tuned to the two meter band or other VHF bands by charging C1 and L1. L1 is 4 turns of #20 enameled wire airwound, ¼" in diameter (use a drill bit), 5mm long center tapped. The antenna can be 18" of any type of wire. IC2 functions as an audio oscillator that is turned on and off by IC1 about once per second. The range of the transmitter is several hundred yards.

James Kretzschmar, N4HCJ
Davis, CA



RECTIFIER DIODE

The project I was making had a Sonalert type buzzer whose operating voltage range was 7 to 12VDC. My PCB was set up for operation at 8V and I put in a 7808 regulator. But when I turned on the power the 7808 only put out 7.5 volts. I felt I needed a better margin for the buzzer than .5V, so I added a rectifier diode (see drawing) and came up with 8.1V. This idea should work as well for zener regulators.

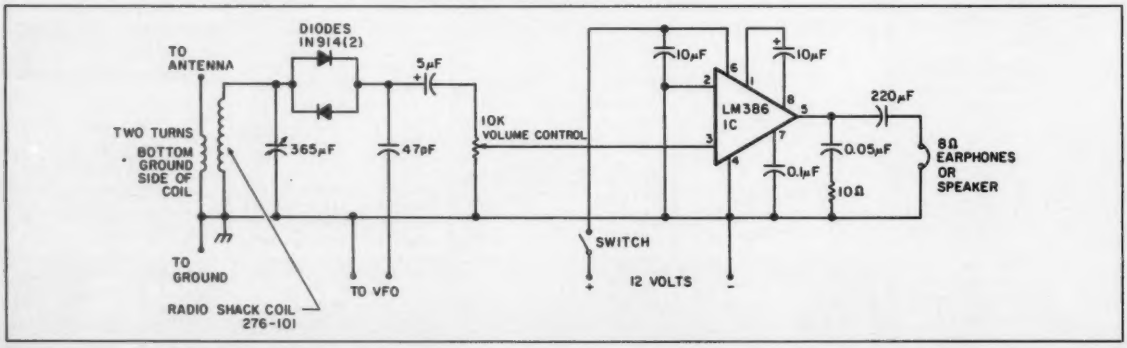
Dick Beckman W7FVM
St. George, UT

SIMPLE CONVERTER RECEIVER FOR YOUR VFO

Here is a simple easy-to-build receiver converter that, when used with your station VFO, makes the combination of these two pieces of gear into a simple Direct Conversion Receiver that will tune the 80 and 40 meter amateur bands as well as other shortwave bands for DX shortwave listeners. It will receive CW, SSB, and AM. The inductance and capacity in the antenna input circuit could be changed to receive 20,15,10 and 6 meters.

This simple converter can be constructed on a small piece of 2" x 2" PC board using terminal strips to solder parts to and inter connecting to other terminal strips they can be bolted or soldered to the PC board. Make sure the converter-VFO output connections are well-shielded. Happy Soldering.

Kenneth Hand WB2EUF
East Hampton, NY



Measure Up With Coaxial Dynamics Model

83000A RF Peak Reading Wattmeter

Take a PEAK with Coaxial Dynamics "NEW" Model 83000A, designed to measure both FWD/RFL power in CW and FM systems simply and quickly. Then with a "FLIP" of a switch, measure "PEAK POWER" in most AM, SSB or pulse systems. Our Model 83000A features a complete selection of plug-in-elements plus a 2 year warranty. This makes the Model 83000A an investment worth looking at. So go ahead, take a "PEAK", you'll like "WATT" you see!

Contact us for your nearest authorized Coaxial Dynamics representative or distributor in our world-wide sales network.

COAXIAL DYNAMICS, INC.

15210 Industrial Parkway
Cleveland, Ohio 44135
216-267-2233
1-800-COAXIAL
Telex 98-0630

Service and Dependability...a Part of Every Product

CIRCLE 186 ON READER SERVICE CARD

JOIN ARRL

BENEFITS FOR YOU

QST, QSL Bureau, Awards, Low Cost Insurance, Operating Aids, Government Liaison and More—Much More!

MEMBERSHIP APPLICATION

Name _____ Call _____

Street _____

City _____ Prov./State _____ PC/Zip _____

$25 in U.S. $33 elsewhere (U.S. funds) Licensed amateurs, or age 65 or over, upon submitting proof of age, may request the special dues rate of $20 in the U.S. $28 elsewhere, in U.S. funds) Persons age 17 and younger may qualify for special rates, write for application.

For postal purposes, fifty percent of dues is allocated to QST, the balance for membership.

_____ Expires _____

_____ Bank. No. _____ Expires _____

The American Radio Relay League

225 Main St. Newington, CT. 06111 USA *73*

SEE Q!

With ARI's new AR-460D, the first hand-held LCR meter that also measures Dissipation Factor. Measure a capacitor's leakage and capacitance too, thanks to the AR-460D's state-of-the-art, fast-measurement design that rivals bench meters costing up to five times more.

INDUCTANCE

- 0.1uH to 2H in 5 Ranges
- 1% Basic Accuracy

CAPACITANCE

- 0.1pF to 200uF in 7 Ranges
- 1% Basic Accuracy

RESISTANCE

- 0.1 ohm to 20 MegOhms in 6 Ranges
- 0.5% Basic Accuracy

If your only requirement is to accurately measure capacitance, then the AR-360D is the instrument for you. It's the only hand-held capacitance meter available that also measures leakage. Use it to measure from 0.1pF to 20,000uF in 9 ranges, with 1% basic accuracy.

For information on our complete line of quality test equipment, including PAL®, EPROM and EEPROM programmers, IC testers, DMM's, and DPM's, or for a copy of our catalog, call us at:

(800) 654-9838

AMERICAN RELIANCE INC.

ARI / VALUE BEYOND MEASURE

®PAL is a trademark of Monolithic Memories Inc.

CIRCLE 93 ON READER SERVICE CARD

ORDER DESK HOURS (Eastern):
MONDAY-FRIDAY 10 A.M. to 5 P.M.
SATURDAY 10 A.M. to 4 P.M.
Technical and VA orders call (703) 938-3350

Electronic Equipment Bank
516 Mill Street N.E., Vienna, VA 22180
Telephone (703) 938-3350

STORE HOURS (Eastern):
Same as Order Desk Hours
Closed Mondays
Thursday 10 A.M. to 9 P.M.

Electronic Equipment Bank—Order Toll Free 800-368-3270

NOVEX 701 HANDSET

NEW!

- Handset w/PPT switch.
- Bracket w/DTMF, speaker & volume controls.
- Upgrade your 'mobile' image!

Specify YAESU, ICOM or KENWOOD.
HSC701Y, I or K...$79.95 + $4. UPS

LAPEL MIC!

NEW!

ADONIS

HW-10

- Clip-on lapel Mic/Earphone.
- PTT switch/battery powered, (battery not included).

Specify ICOM, YAESU, KENWOOD.
Order: HW10I, Y or K $4.UPS
INTRODUCTORY SPECIAL...$39.95

DOCKING BOOSTERS

NEW!

- GaAs FET preamp.
- Compact solid state POWER Amplifier in 30 or 50 watt models
- ICOM, KENWOOD or YAESU from: **$169.95** and up! CALL FOR DETAILS. MICROS & Standard
- Turn your HANDHELD into a Mobile Giant!

WP230 or **WP250**; Y, I, K + $4. UPS

NOVEX 537 SPK MIC

NEW!

- Finally a speaker/mike we can all afford!
- Specify YAESU, ICOM or KENWOOD.

DMC537Y, I or K...$19.95 + $4. UPS

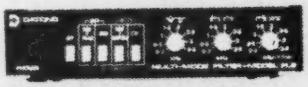
DATONG AUTOMATIC NOTCH FILTER

- Automatically notch out heterodynes, whistles.
- Get rid of 'tuner-uppers' on NET frequencies.
- 1 second is typical lock time/covers 270 Hz to 3.5 Khz.
- Auto/Manual operation in Notch or Peak modes.

NEW!

ANF...$119.95 + $4. UPS

DATONG MULTIMODE AUDIO FILTER



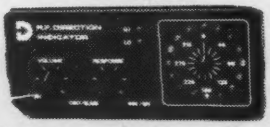
- SSB, SSB & PEAK, SSB & NOTCH, CW & RTTY!
- If you need an audio filter this is it!

FL2...$159.95 + $4. UPS

- The ultimate audio filter: same as FL2 but with AUTO NOTCH!

FL3...$229.95 + $4. UPS

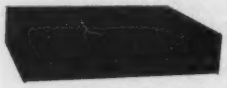
DATONG DIRECTION FINDER



- Doppler DF system for FM receivers.
- User attaches his own coax, antennas & speaker.
- Normal transceive operation even while DFing!
- 20 - 200 MHz, dependant on users equipment.

DF...$329.95 + S&H.

COMPUTER INTERFACE AEA PK 232



- Attach to any RS232 compatible computer for CW,RTTY,ASCII,AMTOR, PACKET and WEATHER FAX (Epson MS-80/RX-80 for Fascimile).
- The PK 232 is THE UNIT to buy! EEB includes the AC Adapter #571512 with purchase!

PK232...$299.95 + $6. UPS

FREE 1988 CATALOG

SHORTWAVE!

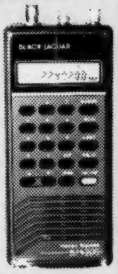
CALL OR WRITE TODAY!

36 Pages over 300 items for the SWLer!

HANDHELD SCANNER

NEW!

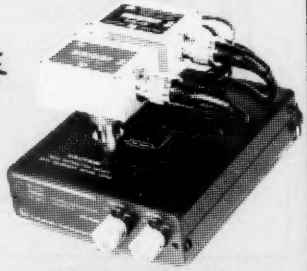
220 MHz!



- Covers NOVICE 220 MHz band!
- 16 Memories!/Scanning.
- Delay/Lockout/Priority.
- 26-30, 60-80, 115-178, 210-260, 410-520 MHz. NICAD power.

BJ200...$229.95 + $4. UPS.

NEW!



- Enjoy SHORTWAVE or EXTEND frequency for YAESU FRG9600 and ICOM R7000 radios.
- The following have PL259 connecters for YAESU FRG9600:
- **FC965DX...$149.95**, 20 kHz - 60 MHz.
- **FC1300...$199.95**, 800 MHz - 1300 MHz.
- **WA965...$109.95**, 30 MHz - 1.5 GHz.
- Control console for ease of operation switches converters and antennas in/out.

CC965...$119.95.

- **FC7000** for ICOM R7000 with type 'N' connecters. 20 kHz-60 Mhz...**$159.95**
- FC965DX, FC1300, WA965 & FC7000 can be used without Control console and are powered from: FRG9600 or R7000.

DIPMETER

- 1.5 to 250 MHz.
- 6 plug-in coils.
- Use as OSC for receiver alignment.
- See the review in '73' Magazine (nov, 87).

DM-4061...$79.95 + $4. UPS

RF SIGNAL GENERATOR

- 100 KHz - 150 MHz; 450 MHz on harmonics.
- RF output: 100 mVs.

SG-4160...$149.95 + $4.

SWR/RF ANTENNA METER

- Read SWR, RF power and field strength
- 10 or 100 watt range.
- 1.7 to 150 MHz.

SWR3P...$19.95 + $4. UPS

EEB

- We ship world-wide
- Shipping charges not included
- Prices & specifications subject to change without notice

10 miles west of Washington, D.C.
Sorry—No COD's
10-5 Tues., Wed., Fri. 10-9 Thursday
10-4 Saturday Closed Sunday and Monday

VISA

ELECTRONIC EQUIPMENT BANK
516 Mill Street, N.E.
Vienna, VA 22180
Order Toll Free: 800-368-3270
Technical and VA Orders (703) 938-3350

CIRCLE 43 ON READER SERVICE CARD

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Ave.
Saugus CA 91350

The Novice Shall Inherit Ham Radio

I finally found a terrific group of hams. They are everywhere. I talk to them every night on my way home from work. I chat with them on weekends on 10 meters. I meet more and more of them on each business trip. They are warm, friendly—and most important—they are neither stodgy nor steeped in the traditions of the past. The saviors of ham radio have arrived and they carry a bright banner that reads "Enhanced Novice!"

When the ARRL backed the original Novice Enhancement proposal, they likely envisioned that any growth would come mainly from the members of a family where there was already one ham as a member of the household. This happened in many cases. I know a lot of OMs whose wives not only got their ticket, but who are a lot more active than their spouse. There's an increase also. The number of younger people on the air—mainly hams' sons and daughters—also increases. Most seem to be pre-teens, and their interest does not seem to be as much in ham radio as in keeping in touch with mom and dad.

It turns out, however, that these new ops are a minority. Whence the bulk of new ops?

10½ Meters!

Try a little SWLing on the Novice portion of 10 or 220. Listen past the text of a conversation and pay attention to the operating procedure. The new Novice from a ham family is usually shy and mistake-prone. The 10½ meter operators ("HFers" or "Sidebanders"), however, sound like experienced operators who use a strange language. He asks for the "10-20", or just "20", instead of QTH. Goodbye isn't 73, but "Good Numbers". Instead of saying to look for him on the air on his return trip, it's "on the flip-flop." A stop at the filling station is to "get more go juice" and nobody owns a rig, but a "two-way"! That's just a bit of what's been on the Novice voice bands this past year. Yes, this CB lingo has caused many higher class licensees to grumble.

This is only the tip of the iceberg, however, of HFers. More and more active and retired HFers and Sidebanders (HFers from here on) are finding out that with only a 5 wpm code test and a few simple questions, they can do legally what they did illegally for the past two decades!

There are some who believe that the real purpose of Novice Enhancement is to clean up or at least to minimize the amount of illegal activity taking place just above 11 meters and below 10 meters. I doubt that the FCC had this in mind, but it does appear an unexpected side benefit.

Imagine being in the shoes of an illegal HFer. Most of the time, propagation on 10 meters is the same as on 10½ meters. Only a fool would stay where he shouldn't be, when with an evening or two of memorization and a week of CW practice he can have legal call letters. Many HFers are taking the path toward ham radio as a way of self-preservation. In addition, they have access to several other bands. Not a bad deal.

I started doing a bit of research on the potential political clout of HF converts to ham radio. Their numbers astound—most are drawn from mid-70s FCC figures of the legal Class D Citizens Radio service when growth was at its peak. While the FCC estimates that, at its peak, there were upward of 60 million 11-meter Class D CB sets in the hands of the public, licensing figures seemed to peak at about 20 million. CBing went way down during the '70s gasoline crunch, and by 1980 rigs languished in attics, in basements, and on flea-market tables. CB would never become a hobby for the masses since folks use CBs only to find gas and avoid speeding tickets.

The industry estimates that, at the time, about 1% of non-ham personal communications enthusiasts migrated above the 11-meter band. Most found that the ham gear of the day was easily modified to operate in the 10½ meter band, and the population of that spectral parcel grew. At one time, there were over 100,000 known operators on the 10½ meter band! The known operators were the ones listed in the two-volume set of the HF International "Callbook". Norm Mueller, a representative of this company, believes his Callbooks list only half the 10½ meter users. This indicates a peak usership of 250,000 HFers—a quarter million potential Enhanced Novices!

Politically Savvy

Many of these guys and gals have "two wayed" for almost two decades. They are, for the most part, excellent operators. With experience comes political awareness—especially in matters pertaining to ham radio. This is especially evident on the local 220 repeater.

"HFers—a quarter million potential Enhanced Novices!"

The political acumen of the HFer-turned-Enhanced Novice first hit me while on a trip to the San Francisco area early last spring. I had my IC-3AT along and wound up as the first QSO for a guy who had just received his ham ticket an hour earlier. It took him that long to find someone on the air at midday.

The first thing I noted was that he knew who I was. That seemed strange until he explained that he had been listening to my Westlink newscasts since the late '70s when repeaters in San Francisco started to carry them. "Why would he be listening to Westlink if he wasn't a ham," I thought. I didn't have to ask the question. He allowed that he had been an HFer since '72 and would never have gotten a ham license to "just work Morse code".

He said "No" to upgrade plans, but intends to plunge into ham radio politics. He wants to make it easier to get a license by doing away with the code entirely for the Novice, and eventually for all grades of licenses. He also wants to be the first Novice to become an ARRL official—he has his eyes on the Pacific Division Directors chair. He wound up the QSO with this terse and foreboding statement—"Bill, there's power in numbers". He is so right.

I was on the road quite a lot during 1987, mainly as the field producer for "The New World of Amateur Radio" videotape. It wasn't until the ARRL National Convention in Atlanta that I had a chance to monitor the local 220 repeaters. It was mid-Summer and there were already many active Enhanced Novices. I heard a lot of enlightening items and it brought back memories of my QSL a few months earlier back in San Francisco. While Techs through Extras on 2 meters were talking either convention or aches and pains, the Novices on 220 were touching on the future. Imagine which I found more inspiring. I soon outfitted my new car with 220.

It's Fun!

We have a lot of fun. After all these years, it hit me. For the first time in a long, long, long time I was communicating—not just talking to be heard! And the vast majority of those I was talking with were New Novices! Most told me, like the fellow in San Francisco, that they have no immediate plans to upgrade.

The new Novices will probably give the ARRL a try—if the ARRL makes a concerted effort to lure them. If they fail to attract them, however, the new Novice may well divorce himself from the mainstream of the amateur community. They will be ripe for the selection and organization by someone ambitious enough to build a national organization to politically represent their needs, wants, and desires. Dwell on it!

Did you know that Pete Hoover W6ZH, grandson of Herbert Hoover, operated as W6KA from inside the American Red Cross float? He did it on SSB using a Ten-Tec Corsair II in the body of the float as an antenna. Pete also has 2 meters and 220 MHz FM gear on-board. He told me a few weeks back that his order of priority was to work Red Cross allied amateur stations and as many Novices as he could! I get the feeling he's as excited about what's happening as I am.

Happy Anniversary to the Enhanced Novices from those of us who appreciate you and who understand how important you are to the very survival of amateur service. . . de WA6ITF

QTH DX

QTH is Iceland

Leon Fletcher N6HYK
274 Webster Dr.
Ben Lomond CA 95005

THE NONESUCH COUNTRY

Iceland (TF) is *not* on the list of the "100 most wanted DX countries," according to the most recent (July 1987) survey by *The DX Bulletin*. Icelandic hams can be found by US operators without too much searching. Some Icelandic stations even come up on some of our DX nets a few times a year.

Thus, as a DX country, Iceland is not particularly *rare* in Webster's meaning of "not frequently found." But as a nation, Iceland is indeed *rare* in the sense of "unusual." Just as starters, consider these records: Iceland leads the world in:

- Having the most VCRs per capita.
- Publishing the most books per capita.
- Reading the most books per capita.
- Having the most tractors per acre.
- Drinking milk.
- Daily protein consumption.

Almost Paradise

Most significant, Iceland tops all nations on the "Physical Quality of Life Index"—a rating system that measures desirability, comfort, ease, education, and other such features.

Since Reagan and Gorbachev met in Iceland in October 1986, the country has not seemed quite as remote and unfamiliar. Just before, during, and after that meeting, the media crammed us with words and pictures of life in what many of us learned—generally as quite a surprise—that:

- Icelanders don't sit around in igloos, bundled up in layers of bear skins, trying to keep warm. Actually, during the winter the average temperature in Iceland is higher than in New York City.
- Icelanders don't live in an isolated existence, deprived of the "finer things of life." They have a highly-rated professional symphony orchestra, a prominent opera company, a university, an extensive educational television system, the second highest daily newspaper circulation in the world, and more.
- Icelanders don't die young; the setting is not that rugged, so they don't have to work so hard at routine existence. Both men and women live longer than the residents of almost any other nation.

Iceland's literacy rate, at 99.9%, is nearly six percent better than that of the United States. The death rate of infants is 7.1 per 1,000 births; in the United States, it's a shocking 50 percent higher.

Iceland is ruled by the oldest representative assembly in the world, founded in 930, nearly eight-and-a-half centuries before the government of the United States. The President is Vigdis Finnbogadottir, the world's first popularly-elected female Head of State.

There are no trains in Iceland, but the country's two airlines each year carry nearly twice as many passengers as the total population of the country. The new airport terminal, with international flights stopping for rest and refueling, each year handles more than three times the number of residents.

The country's travel brochures describe Iceland as "The Jewel of the North." To back up that claim, they point to such features as:

- Outdoor swimming pools heated by nature for year-round use.
- One of the country's best salmon rivers located within the city limit of the capital.
- Pony-trekking as "an ideal way of seeing the country."
- Visiting giant geysers, thundering waterfalls, extensive glaciers, steaming lava fields, etc.
- Sailing clubs, golf courses, skiing, snow-catting, bird watching, and more.

Lay of the Land

Still, thinking of Iceland as a wasteland does have considerable validity. Much of the interior is uninhabited–and unhabitable. Lava fields extend for miles. There are dismal deserts, which are so much like the moon that our astronauts trained there, getting realistic practice in exploring conditions startlingly similar to what they landed on in outer space.

In Iceland has no snakes or reptiles. There are few wild animals of any kind. And all dogs are outlawed in the capital city. try. One of Iceland's glaciers, Vatnajokull, is the largest in Europe, equal in size to all other glaciers in Europe together–as big as Rhode Island and Delaware combined.

Iceland has more hot springs than any other country in the world. Those springs are used to heat all of the homes, offices, stores, and public buildings in Reykjavik, the country's capital and largest city. Boiling-hot water is delivered city-wide through two ten-mile pipelines. As a result the town is completely smokeless.

Backpacking is a popular sport for visitors, but they must carry paraffin or gas stoves for cooking and heating. Since there are virtually no trees, it's illegal to burn the little scrub that exists in only some areas. Because of the lack of lumber, traditional farm houses were built from sod. Today most structures are built of concrete.

Iceland covers 39,769 square miles–slightly less than the size of Virginia, Ohio, or Kentucky. The population is about 250,000–fewer people than in Norfolk, Virginia, St. Paul, Minnesota, or Sacramento, California.

Fortunately for Americans, most Icelanders speak English, as well as Danish and German. The nation's own language, Icelandic, is very difficult—"nigh on impossible" to learn, according to the popular travel writer Eugene Fodor, in his book *Scandinavia*. The pronunciation rules are very hard, but even more difficult is the language's unusual construction—especially the adding of element-after-element to modify a basic concept, resulting in many words stretching on for dozens of letters. Fodor points as an example to the word "haestarettarmalaflutnigsmannsskrifstofustulkuutidyralykill"–it means, he says, "A latch key belonging to a girl working in a lawyer's office." You may not need that line in your conversations in Iceland, but you've got the idea.

TF Hamming

There are 135 hams in Iceland—one for every 1,852 residents, to be compared with about one in every 533 residents of the United States. There are seven different classes of licenses in Iceland:

N–Novice, 50 watts, CW only
A–50 watts, CW, RTTY
B–200 watts, CW, RTTY, SSB
C–500 watts, CW, RTTY, SSB, SSTV
T–50 watts, VHF and above
R–Repeater
S–Club

There are eight club stations, including one at the University of Iceland and one at a Boy Scout Center.

Iceland and the United States have reciprocal operating agreements for hams. If you're interested in awards, a truly beautiful certificate is offered for working Icelandic hams. The number of contacts required is based on a somewhat complex mix of what ITU Zone you live in and on the band and mode of your contact. For full information write to Islenzkir Radioamatorar, Awards Manager, POB 1058, 101 Reykjavik, Iceland.

Photo courtesy of Icelandair

LETTERS

From the Hamshack

HF Emergencies

Congratulations on another fine edition of 73. I found this edition to be one of the most informative yet for the DXer. I would like to offer a constructive comment on Steve Wolf's article "In Praise of DX and WAS Nets". If Steve is looking for dependable emergency communications on the HF bands, he need only tune to *The International Amateur Radio Network*. The IARN is active every day and monitors 10, 20, and 80 meters for emergency traffic. This international network has a proven record for passing emergency, health, and welfare traffic.

He could get in touch either by calling in on net frequency, or if he has a computer and modem, he could contact our Central US Computer Center, "The Cleveland Hamnet" and talk to the SysOp who is David Speltz, KB1PJ. The "HAMNET" is open 24 hours and the telephone number is 216-942-6382. He could also talk to me via "The Circuit Board" BBS, which is the computer center for IARN. The hours for The Circuit Board are 2300–0300 UTC weekdays and 1700–0300 UTC weekends at 207-465-7288.

Jim Sammons N1FID
Assistant Network Manager for IARN

VE1SH—Silent Key

Ron Hessler VE1SH died a few weeks ago—another smoking fatality. My age too. Though I'd never met Ron, we'd corresponded frequently over the last couple years. Developed quite a friendship.

I was looking back over Ron's letters with the idea of doing an obit which would list his many accomplishments. But the list is so long that it's overwhelming. Ron got started in amateur radio about the same time I did—almost 50 years ago. He became the Canadian ARRL Director and then founded the Canadian Radio Relay League (CRRL).

Ron was an outstanding businessman—I think you'll find his perspective interesting. Here's the last letter I received from him.
—Wayne

In answer to your question as to the health of ham radio in Canada—all I can tell you is that, as in many other matters, we closely parallel the States. Far as I can see, no real difference and we don't even have incentive licensing for an excuse! Our average age group is 55 and, like yourself, we are not getting the youngsters any longer.

I agree *completely* with you but I just cannot see how we are going to awaken our "leaders" into at least trying to do something about the situation. They *all* seem to pay lip service to the urgent need to get youngster back into the service. . . But, nothing happens. No programs—not even on the agendas of most meetings. And, when it is, all that seems to happen is to duly recognize the problem. Radio club meetings are attended mainly by Senior Citizens and they just don't want to be hassled into anything. . . mainly concerned about when the coffee and doughnuts are going to be served!

The recent CARF/CRRL/DOC Symposium was so important that DOC didn't even bother showing up! A complete waste of time and money and I have not been hesitant about informing all and sundry what I thought about it before and after the fact. A pile of unadulterated crap!

Back when these symposiums first started, they were very well attended and quite a few things accomplished. However, due to the ever-changing officials in CARF/CRRL/DOC, the symposiums have degenerated not even worth the money or effort. I hear that the attendance, at this Winnipeg meeting, was under 50. 'Course, what do they expect, when they hold these symposiums in a remote and hard to access place like Winnipeg?

As I have told our CRRL President (little good it will do) what we should endeavor to convene is a symposium with but one single subject and I don't have to tell you what that is? But no, he is so busy with more important things as trying to coordinate the amateur communications on the forthcoming Russian Canadian TransPolar ski trek.

ARRL? No, quite frankly, I have seen absolutely no sign/indication of direction as you call it. I have been extremely busy just trying to get QST to include, in the silent key column, the obit of a personal friend of mine (VE1EE) who passed away last December. After much blood, sweat and tears, buck passing between ARRL and CRRL plus much name calling, etc., I have now been assured by Mr. Sumner personally, that the obit will be in the October issue. You just wouldn't believe, Wayne, the bureaucracy I ran into. However, perhaps the installation of their new IBM System/38 Computer ($419,000.00) will solve all this. And, perhaps it will be smart enough, at this price (no pun intended), to give some direction?

Now I got a bone to pick with you. You have been bugging me to give up smoking. Well, I did, cold turkey a month ago and have never been in such ill health, as a result, ever since. Terrible cough, all kinds of anti-biotics and narcotic type cough medicines prescribed by the vet, followed by, three days ago, a complete loss of my voice. Methinks I had better cure myself and go back on the weed again. Which, as I told Eileen, if everything does not clear up, in another week, is exactly what I am gonna do!

Because, apart from any other reason, my ham activity is now confined to CW. I never liked CW before, but now in my present circumstances, I think it is golden. At least—better than nothing or just being confined to being a SWL?

In answer to your closing question...I constantly am trying to *cause* events; however, I don't seem to be doing any better than you!

Ron J. Hesler VE1SH
Sackville NB EOA 3CO

Ron did more than any other Canadian to promote amateur radio in Canada. I'm going to miss him.
—Wayne

Kudos

I continue to enjoy my subscription to *73* and especially your editorials which always express excellent and insightful opinions about our hobby. I think you do a good job in covering most, if not all, aspects of the hobby to be appealing to the widest audience.

Finally got my rig back on the air in October and have had a great time working DX. So far, 73 countries worked toward the DX Dynasty Award. I earned DXCC back in 1969 from Wisconsin. Since my gear is now over 20 years old, I'm looking to upgrade to either IC-761 or TS-940. I noticed you went with the 761.

I followed your suggestion on keeping a more detailed notebook on my contacts which is a great idea. It is interesting to note that although there have been great technical advancements in ham equipment over the past 20 years, the basic content of the typical QSO is essentially unchanged. I've tried to interject some personal information into my contacts, such as "Age 38, Ham for 26 years".

January issue was tremendous with all the DX articles! I really enjoy the human interest and operating articles about the Colvins (whom I've contacted), and Jay O'Brien W6GO. It's interesting to me to read about their backgrounds. We have a very diverse crowd in ham radio, even though many are retired. That's what makes our hobby fun!

Incidentally, I really look forward to the DX column each month and have also subscribed to the DX Bulletin. Chod Harris does a great job with both and I enjoyed talking with him the other day when I phoned in my DX report. With a simple HF6V ground mounted vertical and a 22-year-old rig, I need all the help I can get! I'm hoping to get an opportunity to join a DXpedition, or make a visit to Chod's "The Last Resort" on Montserrat. Talk about fun!

I'll be looking forward for W2NSD. Keep up the excellent work. It's a fine magazine and really enhances my enjoyment of our hobby.

Joe Matt WA9AQE
Pittsburgh PA 15237

Thanks for taking the time to write—it's really appreciated.

You know, it's a funny thing, but when I'm on the air a high percentage of the chaps I contact, being aware of who I am, treat me like a DX op and try to sign off as quickly as possible. I often have to almost tie them hand and foot to get 'em to talk with me. I don't get my kicks from filling a log page—I'm there to meet people and hopefully turn them into friends I can rap with when we meet again on the air or at a hamfest.

On the air I try to find out the other person's interests or business so I can ask questions—being interested in almost everything. Hells bells, there's got to be some benefit to having read a few thousand books and tens of thousands of magazines. . . right?

Re my editorials—I don't want to put too many readers on mental overload, so I've been taking it easy.

See you on 20—or Dayton, whichever comes first. —Wayne

OP-ED

by Larry Ledlow, Jr. NA5E

Return of the Living Dead

Novice Enhancement celebrates its first birthday this month, an event worth noting even if you're not a Novice. The full count isn't in yet, but certainly the expanded privileges had an impact on growth. W5YI recently reported a net increase of more than 9100 US amateurs, nearly all of whom were Novice and Technician licensees, during the 12 month period ending in October 1987. Remember that Novice Enhancement only took effect in late March last year, so the reporting period only covers seven months with the new privileges.

The overall US ham census grew nearly three percent. In fact, the Novice and Technician population grew more than six percent. Is that good or bad?

I know a lot of folks will look at the percentages, then roll their eyes back and moan, "Big deal!" Frankly, though, the numbers are neither good nor bad; they're significant. They tell us *something*, but not everything.

I look at the FCC licensing numbers every month. Spring's Novice Enhancement brought an enormous increase of new license applications. So much of an increase, in fact, the FCC couldn't keep up, and license processing delays were 90 days or more! During the summer, the numbers fell off. After all, people have other things on their minds during summer, and most license courses only run during the spring and fall. The numbers were a little sluggish in October (about 750 new Novices), but November brought about 1100 Novice applications, a 42 percent increase over October. Most Novice courses finish in November and December, so new applications are understandably greater.

Even with incomplete data, it's pretty clear that Novice Enhancement has had a positive impact on amateur radio growth in this country. It was an important step forward, but was it enough?

Re-thinking No-Code

Five years ago I wrote a rather exhaustive argument to the FCC *against* the no-code license proposal. A lot of other hams wrote similar arguments, and the Commission killed the no-code license "forever."

Yet the idea persists. I regularly get mail from readers debating the no-code license. Fred Maia W5YI has recently discussed no-code licensing in his bi-weekly newsletter. His readers' comments clearly show strong interest in such a license. Even our "Fun!" poll results show nearly *half* of the respondents favor no-code. The general idea is not dead by any means in the minds of most hams, and I think it's time to reexamine the no-code license.

"It's fallacious to argue in favor of Morse code as an artificial barrier to keep the riff-raff out."

I believe the single greatest impediment to growth in American amateur radio is the Morse code requirement. Whether real or imagined (I actually believe the latter), the difficulties most would-be hams face with Morse code are serious, and more often than not insurmountable, obstacles. Virtually everyone except for about 0.02% of the general population with certain learning disabilities can learn Morse code. The majority of would-be hams who "cannot" learn it fail, because they suffer from poor study habits, or simply psyche themselves out against the code.

Others throw in the towel long before they even try. Many people don't even attempt to learn code, because they feel amateur radio doesn't offer enough to motivate them to overcome the obstacle. "Why should I?" is a perfectly good question.

Most arguments against a no-code license class in this country usually involve the words "tradition" and/or "like CB." There's something to be said about the tradition of Morse code in our hobby. Then again, strong ties to tradition can be detrimental to modernization and growth. Many, many hams are afraid a no-code license will "open the gates" and flood the hobby with a lot of CB-like nonsense.

I am as concerned as anyone about the possibility of uncontrolled growth of amateur radio. Bigger is not necessarily better. Morse code keeps a lot of sleaze bags out of the hobby, but it keeps even more fine people out, too. Even sleaze bags can learn code. Once in a while they do and get a ham license. It's fallacious to argue in favor of Morse code as an artificial barrier to keep the riff-raff out.

The only solid argument against no-code involve international regulations, which specify that HF amateur radio privileges must carry Morse code requirement.

But what about no-code operation on VHF or UHF bands? In England, where I lived for three years before coming to New Hampshire, I saw a very succesful VHF-only no-code license in the UK. The United Kingdom has only two license classes, A and B. Both have the same written exam requirements, but the A Class requires a 12 wpm code test. B Class licensees can operate on any and all ham bands two meters and above. Ham growth in the UK has its own problems centered largely around licensing administration and reluctance to give up "traditions." Basically, however, the B Class VHF no-code license is successful!

We American hams have industry breathing down our backs just waiting to grab a piece of our spectrum, particularly at VHF and UHF. The 220 and 900 MHz bands are under especially serious threats at the moment. Is there a better way to encourage use of those bands than to assign no-code licensees there? HF technology is generally stagnant, but there's lots of potential for development at the VHF, UHF, and microwave bands.

Let's Give It a Shot!

Heck, I say give it a shot. Put together a decent proposal for a no-code license that will encourage growth of the ham population while also encouraging industry to develop and sell the technology for use at higher frequency bands. If one proposal doesn't work out, then try another until it does.

No-code licensing will never die in the hearts and minds of many hams. Perhaps the idea was ahead of its time when the FCC last ruled on it. Certainly I've changed my mind on the issue, and presumably others have done the same. I'd like to see some sensible, far-sighted no-code license proposals go forth to the Commission now.

We have the power to shape our future, so let's do it!

WANTED: Nominations for *73's* 1988 Achievement Awards

At Dayton, *73* Magazine will honor those members of the amateur radio community and industry who have contributed most to encourage the hobby's growth. In particular, we will present awards in the categories of technology and educational advancements during the past year. We will award an individual or club and a commercial venture under each category.

Nominations for the Technology Advancement Award should discuss the nominee's particular contribution(s) to advance amateur radio state-of-the-art. Achievements in circuit design, networking, radio-related computer hardware and software, digital communications, and other areas should be recognized. Industrial awards may also go to a component or equipment manufacturer or other companies that have made particularly innovative technical products for amateur radio use.

The Educational Achievement Awards will honor an individual (or club) and a company who have done the most in the previous year to recruit new hams and/or to educate amateur radio operators.

Nominations should not exceed 500 words, although we will accept additional supporting material, such as photographs, newspaper clippings, advertising copy, and other information. All nominations must be signed. We cannot accept anonymous submissions. Send questions, comments, and nominations to *Achievement Awards, 73 Magazine, WGE Center, Peterborough, NH 03458.* We should receive all material *not later than April 10, 1988.*

BE A WINNER OF

This YAESU FT-736 VHF/UHF Transceiver in the *73* Magazine "GREAT DAYTON GIVEAWAY"

This most advanced UHFVHF Transceiver of our generation can be yours. Just mail in your entry postmarked no later than April 10 or stop by the *73* or Yaesu booth at the 1988 Dayton Hamvention and fill in an entry form. Drawing to be held April 30 at Dayton.

HERE'S WHAT YOU WIN:

★★ YAESU FT-736 VHF/UHF TRANSCEIVER
★★ YAESU FEX 736-50 6 METER MODULE
★★ YAESU FEX 736-220 220 MHz MODULE
★★ YAESU FTS-8 TONE ENCODER/DECODER
★★ YAESU MD-I 88 DESK MICROPHONE

Get a pencil **right now** and fill in the attached entry blank—and start making room for your new YAESU FT-736.

INSTANT SAVINGS You're always a winner with *73:* Subscribe now and pay only $19.97 for one year—you save over $15 off the cover price! or put over $35 back in your pocket when you sign up for 2 years!

OFFICIAL RULES
(No Purchase Necesary)

1. On an official entry form or a 3" x 5" piece of paper, hand print your name, address and zip code. Enter as often as you wish, but mail each entry separately to *73*'s Circulation Dept.,70 Rte. 202 North, Peterborough, NH 03458. Entries must be received no later than April 8, 1988. And the drawing will be held by April 30, 1988. All entries become the property of *73 Amateur Radio* which reserves the right to print the name and address of the winner.

2. Winner will be selected in a random drawing on April 30, 1988 from among all entries received, under the supervision of the publisher of *73 Amateur Radio* whose decision will be final. Winners will be notified by mail and may be required to execute an affidavit of eligibility and release. Odds of winning will depend on number of entries received. The Publisher of *73 Amateur Radio* will arrange delivery of prize. Taxes are the responsibility of the winner. Any manufacturer's warranties will apply, but the publisher makes no warranties with regard to any prizes. Prizes are not transferable. No substitution for prizes.

3. Sweepstakes open to all residents of the U.S. and possessions, who are at least 18 years old, except employees (and their families) of the publisher of *73 Amateur Radio*, its affiliates, and its advertising and promotion agencies. Void where prohibited or restricted by law.

4. For the winner's name, send a stamped, self-addressed envelope to *73 Amateur Radio* Circulation Dept.,Rte. 202 North, Peterborough, NH 03458.

☐ **YES!**

Mail to: *73*'s Great Dayton Giveaway
Circulation Dept.
70 Rte. 202 North
Peterborough, NH 03458

Enter me in *73*'s Great Dayton Giveaway and start my subscription to *73 Amateur Radio* for the term checked:

☐One year for $19.97 ☐Two years for $34.97
☐Check enclosed ☐MC ☐VISA ☐AE

Card # _____ Exp. Date _____

☐No, I do not wish to subscribe now, but please enter my name in *73*'s Great Dayton Giveaway.

Name _____ Call _____

Address _____

City _____

State _____ Zip _____

Offer valid only in the U.S., its territories and possessions. Please allow 6 weeks for delivery of first issue.

6846SW

"They said I couldn't work DX with just 100 watts. Especially with a radio that has less than 1000 switches on the front panel.

But the truth is, I'm working lots of DX, more than some of these blockbuster types, thanks to my Yaesu FT-747GX.

You see, my no-nonsense FT-747GX was designed with me in mind, so I can hop around the band fast to nail those DX stations. While the other guys are warming up their amplifiers, I'm working the new country!

My FT-747GX has a super receiver, with a directly-driven mixer for great overload protection. And, Yaesu included the CW filter in the purchase price (I used the money I saved on postage for the QSL cards!).

And my FT-747GX is loaded with other features. The receiver works from 100 kHz straight through to 30 MHz, and it's a fantastic shortwave broadcast receiver. I can use all twenty memories for that alone! Plus it's got dual VFOs. A noise blanker. Split frequency operation for the pile-ups. And scanning up the band helps me check out openings as they happen.

I just put in the optional crystal oven, and next month I'm going to pick up the FM board. I can't wait to tell my buddies I worked England on a repeater!

And with the money I saved when I bought my FT-747GX, I got a second ten-meter antenna for satellite work on the high end of the band. I use my personal computer to tell me what satellites are going by, and the computer even sets the frequencies on the radio for me.

Now my friends are getting FT-747GX rigs, too. I knew they'd figure out my secret weapon sooner or later. But now I'm setting the pace!

Thanks, Yaesu. You've made a rig that makes sense."

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. **Repair Service:** (213) 404-4884. **Parts:** (213) 404-4847. Prices and specifications subject to change without notice.

YAESU

CIRCLE 165 ON READER SERVICE CARD

"They laughed when they saw my radio. Then they saw my logbook."

KENWOOD

pacesetter in Amateur Radio

DX-cellence!

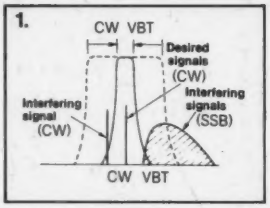
#1 Rated HF!

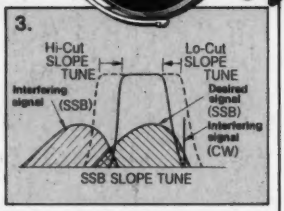
TS-940S

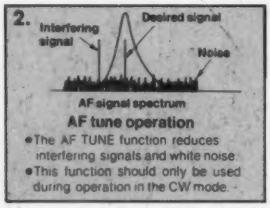
Competition class HF transceiver

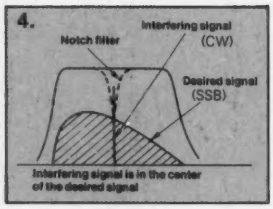
TS-940S—the standard of performance by which all other transceivers are judged. Pushing the state-of-the-art in HF transceiver design and construction, no one has been able to match the TS-940S in performance, value and reliability. The product reviews glow with superlatives, and the field-proven performance shows that the TS-940S is "The Number One Rated HF Transceiver!"

- **100% duty cycle transmitter.** Kenwood specifies transmit duty cycle ***time.*** The TS-940S is guaranteed to operate at full power output for periods ***exceeding one hour.*** (14.250 MHz, CW, 110 watts.) Perfect for RTTY, SSTV, and other long-duration modes.
- **First with a full one-year limited warranty.**
- **Extremely stable phase locked loop (PLL) VFO.** Reference frequency accuracy is measured in ***parts per million!***






2.
Interfering signal
Desired signal
Noise
AF signal spectrum
AF tune operation
•The AF TUNE function reduces interfering signals and white noise.
•This function should only be used during operation in the CW mode.



1) CW Variable Bandwidth Tuning. Vary the passband width continuously in the CW, FSK, and AM modes, without affecting the center frequency. This effectively minimizes QRM from nearby SSB and CW signals.

2) AF Tune. Enabled with the push of a button, this CW interference fighter inserts a tunable, three pole active filter between the SSB/CW demodulator and the audio amplifier. During CW QSOs, this control can be used to reduce interfering signals and noise, and peaks audio frequency response for optimum CW performance.

3) SSB Slope Tuning. Operating in the LSB and USB modes, this front panel control allows independent, continuously variable adjustment of the high or low frequency slopes of the IF passband. The LCD sub display illustrates the filtering position.

4) IF Notch Filter. The tunable notch filter sharply attenuates interfering signals by as much as 40 dB. As shown here, the interfering signal is reduced, while the desired signal remains unaffected. The notch filter works in all modes except FM.

- **Complete all band, all mode transceiver with general coverage receiver.** Receiver covers 150 kHz-30 MHz. All modes built-in: AM, FM, CW, FSK, LSB, USB.
- **Superb, human engineered front panel layout for the DX-minded or contesting ham.** Large fluorescent tube main display with dimmer; direct keyboard input of frequency; flywheel type main tuning knob with optical encoder mechanism all combine to make the TS-940S a joy to operate.
- **One-touch frequency check (T-F SET) during split operations.**
- **Unique LCD sub display indicates VFO, graphic indication of VBT and SSB Slope tuning, and time.**
- **Simple one step mode changing with CW announcement.**
- **Other vital operating functions.** Selectable semi or full break-in CW (QSK), RIT/XIT, all mode squelch, RF attenuator, filter select switch, selectable AGC, CW variable pitch control, speech processor, and RF power output control, programmable band scan or 40 channel memory scan.

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL-922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters • IF-232C/IF-10B computer interface.

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications, features, and prices are subject to change without notice or obligation.

KENWOOD

KENWOOD U.S.A. CORPORATION
2201 E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745